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ARCHIVES OF OPHTHALMOLOGY.

A DISCUSSION OF SOME NEWER PRINCIPLES IN DEALING WITH UNCOMPLICATED CATARACT.[1]

BY DERRICK T. VAIL, M.D., F.A.C.S., CINCINNATI, OHIO.

IN entering a plea for the consideration of so-called "newer principles" in the cataract problem, it seems necessary to state at the onset that this term is used in a comparative sense.

It is not claimed that cataract surgeons have agreed on a code of unalterable principles, which are accepted *ex cathedra* by the rank and file of operators. On the contrary, there is a bewildering array of postulates propounded in such a bewildering mass of literature on the subject of cataract surgery that it may be truly said that there are no "established principles" in the sense of dogmas or creeds.

Generally speaking, however, there are certain guiding principles taught in most of the college classrooms of ophthalmic students and observed in actual practice among the majority of the leading ophthalmologists of the world. These we shall call the "established principles," and they furnish the impulse of our argument in favor of other so-called "newer principles"—newer in the sense that they are founded on more recent advances and are not commonly known or practiced.

In bringing to your attention some of these newer principles, the writer does not present any original methods, but simply collects those which are scattered in many standard text-books and classical monographs on the cataract subject by authors

[1] Candidate's Thesis, American Ophthalmological Society, 1916.

of renown. They are here collected and presented for the sake of study, comparison, and discussion.

The subject naturally divides itself into two headings, viz.: (*a*) *Major Principles*, or those dealing with the economic problem of vision; (*b*) *Minor Principles*, or those dealing with methods.

Of the major principles we shall confine ourselves to the discussion of but two, viz.:

I.—That preliminary iridectomy is a beneficial measure in certain forms of slowly forming or stationary cataract; and

II.—That the patient must wait until his cataract is ripe, or nearly so, before the operation is advisable.

These two major principles are so linked together that it is difficult to discuss them separately, for the former is sustained or justified by the latter, and the most successful outcome of the latter is, in the minds of many, dependent on the former.

Nevertheless, it seems best to discuss them, each on its own merits.

I.—*The Question of Preliminary Iridectomy.*

It is the custom in the practice of many, if not the majority of cataract operators, to perform preliminary iridectomy in certain forms of immature cataract, particularly those in which the cataracts are slowly forming or stationary. The argument in brief is, that from the patient's standpoint this surgical measure will increase his vision while waiting for cataract maturity, and will permit him to go about with reasonable safety until the lens begins to become more opaque; and that when the cataract does begin to increase, the period of incapacity is not prolonged over many months until it may be ripe enough to extract by the established method.

From the surgeon's standpoint the operation proposed is fraught with little danger, is short, painless, trains the patient not to fear the surgeon, and holds him until the time when his cataract is finally deemed ripe enough for extraction; moreover, that the steps of the final operation are thereby shortened, made easier, and more certainly successful. It is interpreted by the patient to be a better assurance that his sight will be restored ultimately.

The present writer followed this principle for many years, particularly in dealing with the more intelligent class of patients. He has abandoned it entirely during the past five years, has nothing to regret and no desire to return to it, for he is convinced that it is founded on surgical sophistry or in some cases timidity, rather than on sound judgment and the patient's best welfare.

There are valid arguments against preliminary iridectomy in these cases, the strongest being that in the light of modern knowledge, verified from many sources, cataract can be easily removed at any stage of ripening and there is call for extraction the moment the question of preliminary iridectomy comes up.

But leaving the question of proposed extraction out of the argument, there are good reasons to decry the preliminary iridectomy.

First: It is an operation where the eyeball is opened and as such does contain an element of risk, however slight.

Second: The result is often disappointing to the patient, for, whatever the improvement in gross or quantitative vision, there is little or no restoration of reading or qualitative vision.

Third: The preliminary iridectomy does not simplify the extraction operation in the hands of an expert; on the contrary, may seriously complicate it, as I have several times observed.

Fourth: One operation is better than two when the same result is obtainable.

Fifth: A preliminary iridectomy necessitates a scar in the limbus; a second such scar in the same locality is objectionable.

As will be shown presently, preliminary iridectomy is never indicated in uncomplicated cataract, for when the vision is impaired to the degree that it would be justified according to the old teaching, the time has arrived for the actual extraction, regardless of the kind of cataract present.

Therefore I wish to maintain that the following principle is sound, viz.:

A preliminary iridectomy in immature uncomplicated cataract is unnecessary and needless, and is therefore never indicated.

II.—As regards the old established principle that the cataract must be ripe, or nearly so, before extraction:

It is the generally accepted dictum enunciated by the majority of the world's highest authorities, from the time of

the illustrious founders of ophthalmic practice of over fifty years ago, down to the present day, that the cataract must pass through the various stages of ripening from the incipient to the ripe or nearly ripe stage, before the most favorable time for extraction has arrived. The period of waiting from the first symptoms until the cataract is deemed ideal for operation is rarely less than two years and not infrequently five years and longer. Indeed one of the most common forms of cataract never gets ripe according to the accepted definition of "ripeness." During all that time the patient is required to go about half blind. It is rarely that he is contented to accept the opinion of the oculist of his choice on this matter of waiting, and so he seeks other counsel, only to find it is too true: he must wait.

The kindest, most conscientious, and most skilful surgeon, who follows and wishes to follow the advice of those who taught him his best lessons in the science and art of ophthalmic practice, needs must tell his patient "your cataract is not ripe enough; you must wait at least six months, perhaps two years"; and this, too, while he is still in prime health and vigor and is splendid surgical material in that the most scrutinizing test fails to reveal anything else wrong with him, mentally or physically.

This principle is so firmly grounded in the minds of the vast majority of cataract surgeons that it amounts to a religion. The argument that the patients who come to them with immature cataracts seeking relief are entitled to have relief and that it is their duty to furnish them that relief, does not seem to weigh against the terrors that arise in their minds when they think of operating on a man only half blind with cataract. And so these unfortunate patients are given "placebo" drops and put off from month to year, until what is gained in the imagination that the cataract is getting gradually ready for operation is lost in the actual fact that the prime vigor of bodily and mental health is deteriorating. Nothing so undermines the foundations of good health and reason as suspense and worry. The newer principle, which during the past five years I have followed in managing these cases of immature cataract, takes the above facts into consideration and for their full value. The statistical table at the end of this paper, show-

ing the results achieved in forty consecutive cases of uncomplicated immature cataract operated upon by me during the past five years, furnishes the basis of my faith in the newer principle.

We are dealing with principles in this paper and to those who for any reason stand out against the intracapsular method of extracting the immature cataract, I wish to present evidence from some who have employed the capsulotomy operation in this stage of cataract.

Weeks, of New York, in a paper on "What Stage in the Development of Cataract, Particularly Senile, Is the Most Suitable for its Removal by Extraction?" (*Cataract Extraction*, Claiborne, Wm. Wood & Co., N. Y., 1908, page 6), states: "On the strength of these observations (experiments in the dead room on extraction of transparent lenses), in spite of the dictum 'hands off' in reference to immature cataract, I began to remove the cataractous lens soon after it had reached a degree of opaqueness sufficient to interfere with useful vision, whatever the form of the cataract might be, in all cases in which such removal was particularly urgent, those being excepted in which the lenses were much swollen." He reports twenty-five successive cases of immature and zonular cataract on which he had operated, and he finishes his article with the following declaration: "When so done, the visual results are not much, if any, below those obtained after removal of mature cataract."

Fuchs, in his text-book (Am. Edition, 1911), advises waiting until the cataract is ripe, but states (p. 524): "The cataract may be extracted before it is fully ripe. Healing takes place with as good results as in ripe cataract."

Meller, speaking of capsule forceps in his *Ophthalmic Surgery* (English Edition, 1908, p. 134), states: "A large opening is made in the anterior capsule directly in the pupillary area. The result of this loss of capsule tissue is that *the capsule cannot produce optical disturbances later on. The remnants of cortex left behind are resorbed through the action of the aqueous, with the result that, even in the operation for unripe cataract or when a large amount of cataract remnants are present, they usually undergo spontaneous absorption after the operation.*"

Roemer (*Text-Book of Ophthalmology*, American Translation,

1912, p. 226) states: "Vision is very often impaired by the nature and situation of the lenticular opacities, so that the patient is incapacitated for work before the cataract has become ripe and we should not needlessly leave such an unfortunate person in the torture of uncertainty because of an antiquated clinical conception. In former years many patients passed away with their hope of restoration of light to their eyes unfulfilled."

He states the newer principle in a nutshell when he adds: "*If the vision is impaired so that the patient is unable to work and the prognosis is justified that vision can be adequately restored by extraction of the lens, the cataract is ready for operation.*"

His requisite for a good prognosis is merely that the retina is functionating, the eye is clean, and the patient in good health.

Smith, of India, who holds the world's record on numbers and, I believe, on results too, has no compromise to offer in dealing with this problem. With characteristic directness he states (*Treatment of Cataract*, Smith, Thacker & Spink, Calcutta, 1910): "When the lens becomes so opaque that vision is no longer useful for ordinary practical purposes, it should be extracted in its capsule."

It is not the purpose of this paper to discuss the relative merits of the different operations for ridding the eye of immature cataract. There are four different methods of technic that I know of for the intracapsular extraction of cataract and three at least for the extracapsular extraction.

It may be that any of these seven methods, rightly carried out, will succeed in as large a proportion of cases as can be achieved by waiting until the cataract is ripe and then extracting after slitting the capsule with a cutting instrument.

To those who hold to the old established principle I will say, patients are finding out that relief from semi-blindness because of immature cataract can be had and they are seeking that relief. I ask, if you in the prime of health otherwise were to become incapacitated on account of immature cataract, would you be content to wait until you could barely count your fingers at one foot from your eyes before submitting to an operation?

The day has arrived when we must consider what has been

done for others afflicted with nuclear or immature cataract and it behooves us to adopt the newer principle and diligently seek the best and surest way of succeeding by that principle.

The argument above stated resolves itself into the following logic:

(*a*) A patient has immature cataract of one form or another. His vision is, we will say, $\frac{20}{400}$; he can no longer read ordinary print. The fundus can still be seen and is normal. The eye is sound aside from the cataract. His general health is good.

(*b*) Immature cataract of any form can be successfully removed by several methods and the results in large numbers compare favorably with the results of operation by the established method on mature cataracts.

(*c*) Therefore: Operate without waiting. It is humane, good surgery, and our bounden duty.

. . . . . .

Of the *Minor Principles*, or those dealing with *methods*, we shall discuss briefly those affecting the following:

(*a*) Cleansing the eye for operation.
(*b*) Controlling the eyelids during the operation.
(*c*) Dealing with the capsule.
(*d*) Dealing with retained lens substance.
(*e*) Time as a factor.
(*f*) Atropine.

It is taken for granted that most surgeons will maintain that the established technic used in dealing with each of the above list of methods is designed to carry out the principle that the best possible things are done to achieve the best results.

As my practice among the forty cases of very immature cataract cited in the appendix of this paper has been different in principle from the established methods as concerns this list, and as I think the newer principles employed contributed largely to results achieved, I desire to state them for your consideration. I wish again to disclaim any originality in these matters, for each point was taken from the writing, teaching, and practice of others. I adopted them because they appealed to me as being sound and better than those ordinarily

employed. In most of them I was drilled by my distinguished teacher, Colonel Smith.

(*a*) *As regards cleansing the eye for operation:*

It is well known that anything which bruises the delicate epithelium of the palpebral or ocular conjunctiva just before operation is objectionable. The best protection against invading infections is a sound epithelial covering. It is therefore wrong to squeeze the lids to evacuate the Meibomian glands, for this cannot be done without insult to the delicate epithelium. Moreover, the thumb nail or finger pulp is not always above suspicion, and, furthermore, I am not convinced that the Meibomian secretion is infective; on the contrary, I am satisfied it is not so. After it has been extruded by the squeezing method, the newly secreted material is certainly no improvement on that which was expressed. Also it is not good practice, in my judgment, to use moist cotton sponges for swabbing the conjunctival sac prior to operation. The sponges may abrade the epithelium; at any rate they must be handled and squeezed out with the fingers, and there again the argument that the fingers are not above suspicion comes up.

It is also manifestly impossible to reach the cul-de-sac with the stream of fluid from a douche bottle, douche bulb or undine when the lids are everted and held apart in the usual way.

The folds of the fornices, especially of the upper, are still collapsed and the opposing surfaces are in contact. The douche is therefore not effective in reaching their surfaces.

The newer principle I wish to mention takes cognizance of the above facts and also of the fact that all that can be accomplished in the normal-appearing eye is to wash out the cells and mucus, which represents the normal shedding or excretion from the epithelium of the mucous membrane. Nature secretes the tears for that purpose in the functionating eye, where the lids are constantly winking and assisting in carrying off this debris, but after operation the lids no longer wink and this material already there had better be well washed out of the sac.

Hence the "newer principle"—no rubbing and no violence, but a full and effective douching with a large stream of warmed salt water, boracic acid solution, or weak bichloride solution, and this done while the eyelids are held away from the eyeballs

on a proper speculum in such a manner that the folds of the fornices are no longer "folds" at all, but the entire sac is one smooth-walled pouch, inviting the swirl of fluid to wash away all detached cells, mucus, and germs.

The "Jullundur speculum" is the only one I know of that will hold the lids when they are lifted to the limit away from the eyeball. By making upward traction on the eyebrow at the same time that the lids are being hung well off the eyeball, the upper sac is thoroughly exposed for the douche stream, as can well be seen by peeping under.

Results: I have performed over five hundred extractions since adopting the above technic and have not had a single case of panophthalmitis.

Results by the established methods of cleansing the eye: According to Ring's compiled statistics of 1032 extractions "by operators of recognized ability in America and Europe" (see p. 41, *Cataract Extraction*, Claiborne, Wm. Wood & Co., N. Y.), panophthalmitis occurred in nearly 2% of the cases in combined extraction.

(*b*) *As to controlling the lids during the operation:*

Much has been written on the use of specula, lid hooks, blepharostats, retractors, etc. Each operator maintains that his method is the best and guards against accidents the most. A cataract surgeon has not graduated in the highest sense until he has devised a new speculum or lid retractor. I have just published (in *Ophthalmic Record*, May, 1915) an article illustrating mine. I shall not describe it here.

I saw Sir Anderson Critchett in 1899 do a combined extraction on the left eye with his left hand, employing *only one instrument throughout*, viz.: a Graefe knife. He dispensed entirely with the services of an assistant. I never saw a more beautiful result in the combined extraction. He held the lids apart with the fingers of his right hand. No speculum was used.

I note that Meller uses no speculum in cataract extraction, as illustrated in his book on *Eye Surgery*. He permits the assistant to simply hold the lids apart with his fingers.

Some operators use a speculum throughout and there is no denying the fact that they rarely have trouble. Others will use nothing but the lid retractors, more or less modified after

the old Desmarres' pattern and they too meet with good success. Still others use the speculum during the section and iridectomy and remove it during extraction, holding the eyelids with the fingers, and others again will use the speculum until the stage of delivery and then employ lid hooks or elevators.

So far as the "squeezers" are concerned, I believe one method is exactly as good or as bad as the others. None will prevent the lens shooting out when the section is completed, if the patient squeezes.

The purpose and plan, therefore, of the speculum, retractor, or what-not is to facilitate the operation and guard against vitreous prolapse during the actual delivery. Vitreous escape is an inherent risk in every cataract extraction.

The principle I wish to urge here is that the eyelids during actual delivery of the lens should be held entirely off the eyeball and hung like a tent in order to take all weight and spasm off the eyeball, and thus prevent as much as possible vitreous escaping during pressure to deliver the lens. By this method the amount of vitreous that need be lost in any case is very small—certainly never as much as by the old methods.

(*c*) *As to dealing with the capsule:*

Many have accepted it as a guiding principle that the lens should be delivered in its capsule and so several methods of technic to accomplish the *radical extraction of cataract* have been devised. I firmly believe that the time will come when this will be the generally accepted method of dealing with uncomplicated cataract. But since it is the anterior capsule that causes so much mischief and disappointment when left within the eye, it is certainly necessary in doing the capsulotomy operation to remove all or as much of it as possible by means of good capsule forceps. A large piece of the anterior capsule must be stripped off, and removed from the eye; this cannot be done with a cystitome, and hence the cystitome should be relegated to the museum of antiquated surgical instruments.

(*d*) *As to dealing with retained lens substance:*

If the cataract is extracted in its capsule, the question of "retained lens substance" is answered at once. But in case the anterior capsule is removed in whole or in part, the ques-

tion at once comes up, what is the best method of dealing with it? If the cataract is overripe, it is best to rid the eye of the debris in the aqueous chamber, because it is degenerated and pathological material and is therefore irritating and slow of absorption. If, however, the cataract is unripe, the cortical fibers left behind are not irritating and will become readily absorbed, because they are not pathological in the above sense. They are to be likened to extravasated blood in the aqueous chamber, which absorbs because the blood cells and plasma were physiological and functionating before they escaped. No attempt should be made to rid the eye of *clear* cortical fibers left behind after the nucleus of an immature or incipient cataract has been removed, provided the anterior capsule is out of the way. The principle involved is clear when the above facts are recognized.

(*e*) *As to time as a factor:*

Too much time is usually consumed in performing the cataract operation in all its details. Cataract patients are usually old and infirm and the consequent shock is needlessly great after an operation that consumes from thirty to forty-five minutes of time. There are two kinds of shock that must be sustained in every cataract operation: the local shock to the tissues incident to prolonged anæsthesia and much instrumentation, and the nervous shock or strain incident to the full realization that so much is at stake. It is exceedingly important that this operation be over with as quickly as is compatible with a finished result. The anæsthesia should be completed in eight minutes' time. The operation completed after that in from three to five minutes' time.

Every instrument that is introduced within the eye is an added risk. The fewest instruments compatible with success should be employed.

(*f*) *As to atropine:*

The wounded eye takes to atropine badly. Whether this is due to the solution being foul, as is often the case, whether it is due to idiosyncrasy that sometimes exists when atropine solution is frequently employed, or whether its action blocks the drainage channel already choked with serum, loose cells, and congested iris and ciliary, or whether, indeed, the eye becomes infected from much manipulation during its use, I shall not

venture to state, but I am convinced from actual experience that atropine, except in very rare instances, is a positive detriment to the eye at any stage after extraction of cataract. It is natural that the cut eyeball in reaction should be congested. This congestion is conservative and useful in nature's process of repair. The surgeon ofttimes mistakes it for oncoming iritis and uses atropine. The iritis then materializes, or in some cases glaucoma.

In conclusion:

The last word has not been uttered in the fascinating and perplexing subject of cataract surgery. We must progress in this as in other surgical matters. The "old established" methods in the surgical treatment of cataract are practically those taught over fifty years ago. It is the hope of the writer that the "newer principles" mentioned will be considered along the lines of progress and a step nearer that fond dream of the cataract surgeon, viz.: a safe operation for immature cataract which any good surgeon can perform in one operation in a few minutes' time, a round central pupil, a clean black pupil, primary and rapid healing of the wound, and complete and satisfactory restoration of vision.

Appendix and Statistical Table:

In order to sustain the argument that immature cataract offers an excellent opportunity to achieve first-class results in one operation, I wish to present a table of statistics, compiled from my records by my assistant, Dr. P. L. Coulter, who was instructed to record *each and every case of uncomplicated, immature, senile cataract with vision of* $\frac{20}{100}$ *and better, that I have operated upon since January, 1910.* It will be noted that the optic disk could be studied with the ophthalmoscope through the dilated pupil just before operation. It is a source of great satisfaction to be able to see that the fundus is normal. There were during the period of time covered in these statistics about twice as many more cases of immature cataract in which the vision was between $\frac{20}{100}$ and counting fingers beyond two feet. The results from operation in this class were equally good. They were not tabulated because the argument of this paper is to support the newer principle that there is no need to wait until the cataract incapacitates the patient, and also that there is never a demand for preliminary iridectomy. In no

case was iritis or infection of any kind present. One eye was lost from choroidal hemorrhage induced by epileptic seizure that followed a smooth extraction. This was the only eye in the series that was lost. The visual results compare very favorably with any achieved after the capsulotomy operation in mature cataract—in fact, I believe are better.

The time will come when it will be taught that the most favorable form of cataract for operation is the *immature* and operators will feel that they are jeopardizing their results by waiting for maturity.

Table showing all cases of uncomplicated immature cataracts having vision of $\frac{20}{200}$ and better, operated on within the past five years by D. T. Vail:

No.	*Name.*	*Age.*	*V. before Op.*	*Optic Disk Seen.*	*V. after Op.*
1	M. B.	60	20/70	Yes	20/35 Ja. No. 2
2	S. D.	60	20/70	Not noted	20/20 Ja. No. 1
3	A. H.	61	20/200	Yes	20/20 Ja. No. 1
4	A. F. L.	45	20/200 R	Yes	20/20 Ja. No. 1
5	S. W. C.	70	20/200	Yes	20/20 Ja. No. 1
6	A. F. L.	46	20/200 L	Yes	20/20 Ja. No. 1
7	M. C.	72	20/70 R	Yes	20/20 Ja. No. 1
8	M. C.	72	20/200 L	Yes	20/40 Ja. No. 1
9	F. B.	37	20/200	Yes	20/20 Ja. No. 1
10	S. E. M.	76	20/200	Faintly	20/30 Ja. No. 1
11	B. F. R.	68	20/200	Yes	20/20 Ja. No. 1
12	C. H. D.	49	20/200	Not noted	20/25 Ja. No. 1
13	J. R.	45	20/100	Yes	20/20 Ja. No. 1
14	C. L. R.	68	20/200	Yes	20/20 Ja. No. 1
15	A. D.	63	20/200	No	20/30 Ja. No. 2
16	R. B.	65	20/50	Yes	20/20 Ja. No. 1
17	H. S. B.	67	20/200	Yes	20/30 Ja. No. 1
18	W. Y.	77	20/200	No	20/40 Ja. No. 3
19	E. W. P.	56	20/70 R	Yes	20/20 Ja. No. 1
20	E. W. P.	56	20/70 L	Yes	20/20 Ja. No. 1
21	J. L. B.	53	20/200	Yes	20/30 Ja. No. 1
22	F. S. M.	71	20/200	Yes	Nil
23	C. L.	57	20/200	Yes	20/30 Ja. No. 2
24	L. F.	65	20/200	Yes	20/20 Ja. No. 1
25	R. J.	79	20/50+	Yes	20/30 Ja. No. 2
26	A. H.	69	20/200	No	20/30 Ja. No. 1
27	J. C. L.	70	20/200	Yes	20/20 Ja. No. 1
28	A.	70	20/50	Yes	20/20 Ja. No. 1
29	N. S.	66	20/40	Yes	20/20 Ja. No. 1
30	J. A. DeA.	74	20/70	Yes	20/20 Ja. No. 1
31	E. S. R.	75	20/70	Yes	20/20 Ja. No. 1
32	J. S.	62	20/100	Yes	20/20 Ja. No. 1
33	C. H. M.	70	20/200 L	Yes	20/20 Ja. No. 1

No.	*Name.*	*Age.*	*V. before Op.*	*Optic Disk Seen.*	*V. after Op.*
34	A. McK.	71	20/50	Yes	20/20 Ja. No. 1
35	A. V.	62	20/200	Yes	20/20 Ja. No. 1
36	G. C. V.	74	20/200	Yes	20/30 Ja. No. 1
37	E. S. R.	75	20/70	Yes	20/20 Ja. No. 1
38	J. F.	68	20/200	Yes	20/20 Ja. No. 1
39	C. H. M.	70	20/200 R.	Yes	20/20 Ja. No. 1
40	J. T.	66	20/200	Not noted	20/20 Ja. No. 1

STUDIES ON THE ACTION OF TOXINS AND PROTEIN DEGENERATION PRODUCTS ON THE EYE.

I.—The Local and Intravenous Effect of Soluble Bacterial Poisons, Crude Protein Poison, and Anaphylatoxin.

By ALAN C. WOODS, M.D., Philadelphia,
AND
JAMES L. STODDARD, M.D., Boston.

(From the Medical Clinic and Pathological Laboratory of the Peter Bent Brigham Hospital, Boston.)

THE etiologic relationship of near and remote foci of infection to endogenous iritis has long been definitely established clinically. We do not know whether the iritis in these cases arises entirely by bacterial metastasis, or by the absorption of toxins from the focus of infection. The possibility of intraocular inflammation resulting from bacterial infection by way of the blood stream has been conclusively proved by the well-known experiments of Poynton, Stock, Rosenow, and others. The probability of a toxic origin receives its chief support from the large clinical group of endogenous iritides that fail to show any focus of infection, and from the evidence of a toxæmia which is apparently of gastro-intestinal origin. This observation gave rise to the theory of auto-intoxication, which has received chief consideration in this country in Drs. de Schweinitz, Hiram Woods, Risley, Bull, and others.

The contention of Axenfeld (1) in 1894 that toxins circulating in the blood stream could give only degenerative lesions in the eye (retinitis septica), and that outspoken infections were always metastatic in origin, met with much opposition and

accordingly gave rise to a certain amount of experimental work over the rôle of toxins in ophthalmology.

At this time the knowledge of bacterial toxins was in a relatively unformed state. It was well known that such bacteria as the diphtheria and tetanus bacilli elaborated a free toxin in the media in which they were grown, and the general trend was to apply this idea to other bacteria, of which little was known concerning the toxic properties. The toxicity of culture media itself, the possible degeneration products formed there by the action of bacterial proteolytic ferments was not then fully appreciated. (The word toxin is here used to denote any poison of bacterial origin.) The more recent advancement in the knowledge of bacterial toxins and protein and biologic poisons has led us to repeat some of this earlier work with slightly different technic, and to experiment similarly with certain protein poisons, namely, Vaughan's protein split products and the anaphylatoxin of Friedberger.

The earliest work on toxins in ophthalmology was that of Coppez in 1897 (2). Coppez found that while only negative results were obtained by the instillation of diphtheria toxin in the conjunctival sac of normal rabbits, if the cornea or palpebral conjunctiva were lightly cauterized, subsequent instillation of diphtheria toxin produced a marked keratitis. This he believed due to the absorption of toxin by the subconjunctival lymph vessels. De Christmas (3), in 1897, obtained a slight inflammatory reaction by the injection of the filtrate of gonococcus cultures into the anterior chamber of a normal rabbit's eye. By precipitating the unfiltered culture with three volumes of alcohol, taking up the precipitated proteins in sterile water, and injecting this into the anterior chamber, he produced a marked iritis. He therefore assumed the true toxin of the gonococcus was closely adherent to the cell body and was precipitated with the proteins. Morax and Elmassian (4) obtained a conjunctivitis by the instillation of living and dead gonococci into the conjunctival sac. Only slight symptoms of irritation were produced by instillation of the filtrates of the gonococcus and Koch–Weeks bacillus into the normal eye. With a "staphylotoxin," obtained by growing the staphylococcus one month and then filtering through porcelain, a moderate conjunctivitis was obtained by prolonged instillation. Coppez (5) in 1899, by injecting a streptococcus filtrate into the anterior chamber, obtained a

mild iritis, only slightly more intense than that produced by similar injection of sterile culture media. A pneumococcus filtrate gave practically no results. Randolph (6) in 1903, working with the filtrates of gonococcus, staphylococcus, streptococcus, pneumococcus, and B. coli, obtained no reaction by instillation of these filtrates into the conjunctival sac of rabbits. A definite conjunctivitis was obtained by subconjunctival injection, and an iritis was produced by anterior-chamber injections. Stock (7) in 1903 injected rabbits intravenously with the filtrates of cultures of the diphtheria bacillus, staphylococcus, and B. coli. Daily intravenous injections over periods of from three to twenty-six days gave uniformly negative results, with the exception of a slight conjunctivitis in one case. Koske (8) in 1905 obtained intense inflammatory reactions by the anterior-chamber injection of living bacteria—B. subtilis, prodigiosus, and staphylococcus,—and a pathogenic yeast. Less intense reactions were obtained by similar injection of killed cultures, and but very slight reactions by injection of the filtrates of these same organisms. Stock (9) in 1905 produced ocular inflammation, a papular iritis, followed in three months by a choroiditis disseminata, by the intravenous injection of pathogenic yeast. This same phenomenon had previously been shown by Cohn and Sternberg. Golowin (10) in 1909 thought slight microscopic changes could be obtained in the eye by intravenous injection of his prepared cyto-toxin. Gilbert (11) in 1911 proved incidentally that sterile culture media could produce a definite reaction when injected into the anterior chamber. Rollet and Aurand (12) in 1912 produced a plastic iritis by injection of filtrate of gonococcus cultures into the anterior chamber and vitreous. Guillery (13) in a series of investigations over the action of ferments in the eye and their relationship to sympathetic ophthalmia, finally produced a uveitis by the intravenous injection of the filtrates of ferment-producing bacteria. In his latest paper he terms this toxin "Uveagifte," and believes it has a selective action on the uveal tract, causing a round-cell infiltration. The toxic action of the filtrate he believes due to the ferment activity. On this subject one of us shall have further to say in a subsequent communication.

Dold and Rados (14) in 1913, working with a bacterial anaphylatoxin, reported the production of marked inflammatory reactions following anterior-chamber injections, in as short a time as fifteen minutes, using even very low dilutions of the anaphylatoxin. This work was repeated in 1914 by Arisawa (15) with results largely contrary to those of Dold and Rados. Arisawa obtained symptoms of only slight irritation in three to four hours after injection.

TECHNIC.

Our object in the preparation of bacterial toxins was to obtain such toxins as were present, free from culture media and protein degeneration products. Apparently the toxins of the streptococcus and staphylococcus are either in the cell body or closely adherent to it. The organisms were grown for forty-eight hours on 750*cc* of ordinary 1% peptone, meat infusion broth. The organisms were then separated out by high-speed centrifugalization, and taken up in 30*cc* of 80% alcohol. After twenty-four hours they were again removed by centrifugalization and taken up in 5*cc* sterile normal salt solution. The tube containing this emulsion was then imbedded in carbon dioxide snow until the emulsion was frozen solid. This solid mass was then transferred to a sterile mortar, imbedded in carbon dioxide snow, and ground to a fine powder. This was taken up in 75*cc* of sterile normal salt, and heated to 60° for one hour to destroy autolytic ferments. It was then incubated at 37.5° for twenty-four hours. The ground-up bodies were now removed by centrifugalization, the supernatant fluid pipetted off, and proved sterile by subculture. It contained such toxic material as could be dissolved from the ground-up bacteria. The bodies thrown down by centrifugalization were likewise taken up in 35*cc* of normal salt, and proved sterile by subculture. In the report of the experiments they are termed "killed bodies."

Anterior-chamber injections were made with a hypodermic needle, care being taken to avoid injury to the iris and lens. Intravenous injections were made in the marginal ear veins under aseptic precautions. Subcutaneous injections were made under the loose skin of the back.

EXPERIMENTS WITH STAPHYLOCOCCUS.

A staphylococcus pyogenes aureus, freshly isolated from a case of acute osteomyelitis, in order to increase the virulence, was injected into the abdominal cavity of a mouse and recovered in twenty-four hours. The toxin was prepared as above described. The supernatant fluid was slightly toxic to guinea-pigs, producing symptoms of prostration in four to

five hours after intraperitoneal injection of 5*cc*. The killed bodies gave little or no evidence of toxicity on intraperitoneal injections.

Experiment I.—Two rabbits were injected in the anterior chamber with 0.25*cc* of the supernatant fluid. Twelve hours after injection they showed slight conjunctivitis, dimming of the cornea, marked pericorneal injection, and a grayish, thickened, irregular iris. One eye was now removed for microscopic study. The symptoms persisted in the remaining eye for some days and then gradually subsided with the organization of the cornea, and the formation of synechiæ.

Histological examination of the removed eye showed swollen iris and ciliary bodies, with fibroblastic invasion of the stroma of the iris, and a marked lymphocytic infiltration around several ciliary processes. There was a slight fibrinous exudate into the anterior chamber.

Experiment II.—Two *cc* of the supernatant fluid were injected into the posterior part of the orbital vault. No symptoms or changes of any kind were observed.

Experiment III.—Two rabbits were injected into the anterior chamber with 0.25*cc* of the suspension of killed bodies. Twelve hours later they showed a moderate pericorneal injection, dim cornea, and thickened, irregular iris. One eye was now removed for microscopic study. The symptoms in the remaining eyes persisted for some days, gradually subsiding with formation of synechiæ and organization of the cornea.

Histologically, the enucleated eye showed a thickened cornea, with fibroblastic invasion of the stroma, a swollen iris with posterior fibrinous synechiæ, and a fibroblastic invasion of the stroma. There was a leucocytic infiltration at the angle of the anterior chamber.

Experiment IV.—Two rabbits received daily intravenous doses of 1.0*cc* of the supernatant fluid over a period of twenty-two and twenty-four days. Daily examination of the eyes failed to show changes of any character. At the end of the period the rabbits were killed with chloroform. Autopsies were essentially negative except for kidney lesions. Histological study of the eyes showed no abnormalities.

Experiment V.—Two rabbits received daily subcutaneous doses of 4*cc* of the suspension of killed bodies over a period of ten days. Subcutaneous injections, rather than intravenous, were given with the idea of avoiding any embolic inflammation. Daily examination of the eyes showed no changes of any character. The animals were killed with chloroform at the end of ten days. Autopsies were essen-

tially negative except for kidney lesions. Histologic study of the eyes showed no abnormalities.

Controls.—The alcohol with which the staphylococci were killed, was evaporated to dryness, and taken up in 5*cc* sterile normal salt. Injection of this into the anterior chamber gave no reaction. Anterior-chamber injections of normal salt solution likewise gave negative results.

EXPERIMENTS WITH STREPTOCOCCUS.

A streptococcus hæmolyticus, isolated from a case of septic meningitis, was run through a mouse to increase its virulence. The toxins were prepared as described above. The supernatant fluid in guinea-pigs in intraperitoneal doses of 4*cc* caused uneasiness and slight prostration in four hours with quick recovery. The killed bodies in similar doses, has no effect.

Experiment I.—Two rabbits were injected in the anterior chamber with 0.25*cc* of the supernatant fluid. Twelve hours later they showed a marked conjunctivitis, marked pericorneal injection, thickened, irregular iris. Smears from the conjunctival sac showed pus cells and occasional gram positive cocci, with the morphology of staphylococci. Culture showed staphylococcus pyogenes albus, probably a secondary invader. One eye was now removed for microscopic study. The reactions in the remaining eyes persisted for some time, gradually subsiding with formation of synechiæ.

Histological study of the removed eye showed a swollen iris and ciliary processes, with fibroblastic invasion of the stroma. There was a large fibrinous exudate in the anterior chamber, with clumps of leucocytes in the angles of the chamber.

Experiment II.—Two *cc* of the supernatant fluid was injected into the posterior part of the orbital vault. No changes of any kind were observed.

Experiment III.—Two rabbits were injected in the anterior chamber with 0.25*cc* of the suspension of killed bodies. Twelve hours later a slight pericorneal injection was present, and a sluggish, thickened, and slightly irregular iris. One eye was now removed for microscopic study. The process in the remaining eyes subsided gradually within the next few days.

Histologically the enucleated eye showed a slightly swollen iris with a slight fibrinous exudate over the anterior surface. In the angles of the chamber were small clumps of

lymphocytes and leucocytes and a few disintegrated bacteria.

Experiment IV.—Two rabbits received daily intravenous injections of 1.5*cc* of the supernatant fluid, over a period of eighteen days. The rabbits became very weak and lost weight markedly. After eighteen days one rabbit was found dead in his cage. The second rabbit was killed with chloroform. Both autopsies were, with the exception of kidney lesions, negative. During the course of injections, daily examinations of the eyes showed no changes.

Histological examination of the eyes was likewise negative.

Experiment V.—Two rabbits were given daily subcutaneous injections of 4*cc* of the suspension of killed bodies. Beyond local induration at the site of injection, no symptoms were observed. The eyes remained negative throughout the course of the experiment. Autopsies were negative.

Histological examination of the eyes was essentially negative.

Controls.—The alcohol, with which the streptococci were killed, was evaporated to dryness and taken up in 5*cc* of sterile salt solution. Injection of this into the anterior chamber gave negative results. Injections of sterile salt solution into the anterior chamber gave no reaction.

The same streptococcus was grown seventy-two hours in plain bouillon, the organisms removed by centrifugalization, and taken up directly in sterile normal salt solution without grinding or destruction of the autolytic ferments. This was autolyzed twenty-four hours at 37.5° and the organisms then removed by centrifugalization. The supernatant fluid was proved sterile on subculture. Injections of 0.25*cc* of this into the anterior chamber gave no reaction.

PROTEIN POISON.

The "crude protein poison" of the tubercle bacillus was used in these experiments. It was furnished us by Dr. Vaughan to whom we take this opportunity to express our appreciation. As is well known this poison is prepared by the cleavage of the protein of the bacillus itself by the action of alkaline alcohol (16). The poison is readily soluble in salt solution. This poison killed a 250*gm* guinea-pig in four hours by an intraperitoneal dose of 0.015*gm* or an intravenous dose of 0.00075*gm*. A 2000*gm* rabbit died with typical symptoms of convulsions and paralysis in twelve minutes after an intravenous dose of 0.07*gm*.

Experiment I.—Both anterior chambers of a rabbit were injected with 0.25*cc* of a 1*cc* = 0.001*gm* solution. No reaction was obtained. A repetition with a 1*cc* = 0.002*gm* solution was likewise negative. With a 1*cc* = 0.004*gm* in twenty-four hours they showed a slight conjunctivitis, slight pericorneal injection, and a slightly thickened and sluggish iris. With a 1*cc* = 0.01*gm* in twelve hours there were a marked conjunctivitis, extreme pericorneal injection, steamy cornea, inactive pupil, irregular and thickened iris, and moderate hypopyon.

Histological examination of these eyes showed a thickened cornea with a definite fibroblastic invasion of the stroma. The iris and ciliary processes were swollen and likewise showed a fibroblastic invasion of the stroma. There was a moderate leucocytic infiltration of the ciliary body and a fibrinous exudate into the anterior chamber.

Experiment II.—Three rabbits received daily intravenous doses of 0.025*gm* per kilogram of body weight over a period of twenty-five days. The animals showed extreme weakness and a loss of approximately 25% of their body weight. Daily examination failed to reveal any ocular changes of any character. Autopsies were, with the exception of kidney lesions, negative.

Histological study of the eyes failed to reveal any abnormalities

ANAPHYLATOXIN.

This was produced first by Friedberger in 1910, by the action of complement upon the precipitate formed by the union of antigen and antibody. By this purely biological means he obtained from the matrix of protein a toxic degeneration product, pharmacologically similar to that obtained by Vaughan by hydrochemical means. In lethal doses it caused death in animals with all the symptoms of classical anaphylactic shock, and was at first supposed by Friedberger to be the actual cause of anaphylactic shock, and was so termed anaphylatoxin.

The anaphylatoxin was prepared by the technic given by Friedberger (17). Horse serum was used as antigen, rabbits were used to obtain immune sera, and guinea-pigs fresh serum as complement.

In guinea-pigs intraperitoneal doses of 2*cc* caused shivering, slight convulsions, scratching, and prostration, with gradual recovery to normal in twenty-four hours. In rabbits 1*cc*

intravenously in a 1000*gm* rabbit caused classical symptoms, diarrhea, shivering, twitching, convulsions, paralysis, and prostration, with death in twelve hours. In a 1400*gm* rabbit a similar dose caused slightly less intense symptoms, death ensuing in forty-eight hours.

Experiment I.—Two rabbits were given injections of 0.25*cc* anaphylatoxin in the anterior chambers. In twelve hours there was a slight reaction at the site of injection which rapidly faded. The eyes then remained normal in appearance for ten days. Ten days after injection, a slight conjunctivitis appeared, with slight pericorneal injection and a sluggish reaction of the pupil. This reaction subsided within three days and the eyes thereafter remained normal.

Histologically the eyes appeared entirely normal.

Experiment II.—Four rabbits were given intravenous doses of 0.5*cc* of the anaphylatoxin every second day over a period of thirty days. The animals stood this dosage poorly. One animal died after twelve days, the others showed a gradually developing weakness and a loss of weight of from 33% to 50%. Autopsies were essentially negative. Throughout the course of injections the eyes remained negative to ophthalmoscopic and external examination.

Histological examination of the eyes was likewise negative.

Controls.—Injection of 0.25*cc* normal guinea-pig serum into the anterior chamber gave essentially the same reaction as the anaphylatoxin. Rabbits kept under exactly similar conditions as those used in Experiment II., receiving intravenous doses of sterile culture media, increased in weight and remained healthy.

SUMMARY.

Such soluble toxins as are elaborated by a virulent staphylococcus or streptococcus are capable of causing an iritis if introduced directly into the anterior chamber. The toxin is evidently within the body of the bacteria, or is very closely adherent to the body. This fact is made more evident, in the case of the streptococcus, by our failure to obtain any toxin in the autolyzate of living streptococci, while an active toxin was obtained from the streptococci killed, frozen, and ground, thus breaking up the bacterial body. The failure to obtain any ocular reaction by repeated intravenous injection may possibly be due to the toxin not being brought to the eye in sufficient concentration from the blood stream.

The fact that the protein poison caused an iritis only when introduced into the anterior chamber in relatively high concentration, and failed to produce any ocular symptoms when circulating in the blood stream in as high concentration as was compatible with life, is greatly against this poison playing any part in the production of iritis. This same criticism holds true for the anaphylatoxin. The delayed reaction after the direct injection of the anaphylatoxin into the anterior chamber is exactly that obtained by the injection of normal foreign serum, as has been found before by Szily, Fuchs, and other workers on ocular anaphylaxis.

The failure to obtain ocular symptoms in rabbits showing all other symptoms of a grave intoxication, including degenerative nephropathy, is probably due to the fact that these protein degeneration products have no special affinity for the ocular tissues. It is to the further degeneration products of protein, more especially those that may be formed either by a normal or faulty protein metabolism that we must look to find experimental groundwork for the auto-intoxication theory.

CONCLUSIONS.

1. A soluble toxin can be extracted from the bodies of virulent staphylococci and streptococci that is capable of producing an iritis when introduced into the anterior chambers of rabbits.
2. This toxin circulating in the blood stream in moderate doses is incapable of causing iritis in rabbits.
3. The "crude protein poison" of Vaughan can cause an iritis by injection into the anterior chamber.
4. Highly toxic anaphylatoxin is practically inert when injected into the anterior chamber.
5. Crude protein poison and anaphylatoxin, circulating in the blood stream in as high concentration as is compatible with life, cannot cause an ocular inflammation, even when the research animals show all other signs of a grave intoxication.

We wish to express our thanks to Doctor Henry A. Christian, Physician-in-Chief of the Peter Bent Brigham Hospital,

Boston, for his aid in the work, and to Doctor Victor C. Vaughan, of the University of Michigan, for furnishing us the protein poison.

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THREE YEARS' EXPERIENCE IN SCLEROCORNEAL TREPHINING IN GLAUCOMA.[1]

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THE presentation of my experience with sclerocorneal trephining, based upon such a limited number of cases, must find its excuse in the fact that by very reason of the small number, I have been able to personally keep in touch with their after-histories. Thus it has been possible to carefully watch these cases (almost without exception) at intervals after the operation, to have the tension taken, the central vision recorded, and the fields charted. Some of these patients were operated upon before Colonel Elliot's visit to this country, but the majority were operated upon shortly afterwards, owing to the interest aroused by the press accounts of his work. His operation gave a ray of hope to a number of people who had been gradually losing ground in spite of miotics, and (in some cases), in spite of previous operations.

I will not take the time of the Society to go minutely into any of the individual cases except when there has been a return of tension, or some other complication.

Of the three cases of chronic glaucoma with acute exacerbations, my first patient was a rather frail woman fifty-six years of age, who had already lost one eye—the right one. It was in a state of absolute glaucoma with a tension of 58*Hg*. The tension in that eye was permanently relieved by a Lagrange operation with iridectomy. The patient suffered from an acute attack of glaucoma in the left eye, during which time the vision was reduced to counting fingers. After the acute attack, the tension did not fall

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below 35*Hg*. Two Lagrange operations at six weeks' intervals (the first being associated with an iridectomy) relieved the tension only temporarily. Six weeks after the last Lagrange, a trephine without iridectomy was done to the nasal side of the site of the former operations. There was a slight opacity upon the upper anterior part of the lens capsule following the Lagrange operations and previous to the trephine. This has not increased. The central vision is $\frac{20}{30}-$, the field normal, and the tension 8*Hg*. There is a large bleb over the trephine site.

The second case of this type occurred in a woman sixty-eight years of age with immature cataract. The tension after recovery from the acute attack was 29*Hg*. The operation had no noticeable effect upon the cataract. The tension was reduced to 14*Hg*.

The third case of this type occurred in a woman seventy-five years of age whose right eye had been removed. Her physician stated that the eye had been lost from glaucoma and the enucleation had been resorted to in order to relieve great pain. The sight of the left eye was merely light perception. She had suffered from a number of acute attacks of glaucoma. The tension between attacks was 52*Hg*. She desired the trephine in lieu of enucleation to relieve pain. There has been no pain since the operation, the tension is 6*Hg*., the sight unchanged.

Mr. N., sixty-one years old, had suffered from chronic inflammatory glaucoma in both eyes for many years during which period he faithfully used a miotic. R. E. V. = $\frac{8}{100}$, L. E. V. = $\frac{8}{100}$. Fields much contracted. In trephining, a peripheral iridectomy was performed on the right eye and a complete iridectomy on the left. The patient recovered normally from a severe attack of acute, contagious conjunctivitis in both eyes several months after the operation. The central vision improved, the fields enlarged, and the tension was 10*Hg*. in both eyes.

In the group of cases of secondary glaucoma following iridocyclitis, my first patient was a man twenty-eight years of age who developed glaucoma after a long-standing iridocyclitis from a blow on the eye. The lowest tension recorded during his glaucomatous period was 35*Hg*. He suffered greatly from pain. The pain was quickly relieved by the operation and the tension remained at 10*Hg*.

The second patient came to me with the history of a long-standing iridocyclitis after cataract extraction. She had been suffering great pain for many months. The right eye had light perception, the left eye was blind. The tension of the right eye was 35*Hg*., that of the left 85*Hg*. Trephining was done on both eyes under a general anæsthesia. After

twenty-four hours, the pain disappeared and has not returned. Now two and one half years after the operation, the tension of the right eye is 8*Hg*., that of the left 13*Hg*. The vision is unchanged except the light perception is a trifle better in the right eye.

The third case of this series occurred in a man sixty-one years old. There was mere light perception and the operation was done to relieve the pain, and in place of enucleation. The pain has been entirely relieved and the tension reduced from 85*Hg*. to 7*Hg*

The fourth patient of this type was a man sixty-six years of age. One eye was affected. The pain was relieved and the tension reduced from 38*Hg*. to 20*Hg*. by the operation.

The last case of this series, a woman sixty-six, came to me with the history of post-operative iridocyclitis. The tension just before the trephining was 55*Hg*. When last taken, it was 9*Hg*. However, this case was trephined on too recent a date to be sure that the success is permanent.

I have done this operation on only one case of glaucoma secondary to retinal hemorrhages. This patient, a man fifty-eight years of age, suffered from absolute glaucoma of the right eye with repeated corneal ulcerations. His blood pressure was high and the intraocular tension was 70*Hg*. The eye was continually irritable and often very painful, yet he wished to avoid enucleation. The trephining was done in the hope of avoiding the removal of the eye. The anterior chamber was abolished, the tissues very friable, and it was impossible to tap the anterior chamber as in the more normal cases. A complete iridectomy was also done. There was a trifling loss of vitreous but the healing was smooth and the pain quickly relieved. However, two years and one half after the trephine, there was a depression over the site of the wound and the globe was shrunken. The eye was removed with fat implantation in Tenon's capsule.

In one case of glaucoma following anterior adherent leucoma, with partial staphyloma of the cornea and lead deposit on the scar, I did a trephine with a later removal of the metallic deposit and a tattooing of the scar. This was done for a relief from discomfort and for cosmetic reasons, in lieu of enucleation. The discomfort from the bulging, irritated cornea is entirely relieved and the eye is no longer disfiguring. The tension has been reduced from 34*Hg*. to 6*Hg*. Patient exhibited.

I have performed sclerocorneal trephining in only one case of glaucoma occurring after cataract extraction where no other

complication existed. This is not a typical case of glaucoma due to the extraction, because it also ensued in the other eye which had not been operated upon. It does, however, illustrate the ease with which this operation can be performed in similar cases.

In May, 1903, I extracted a cataract from the right eye of Mr. B., sixty-five years old. A broad iridectomy was done at the time. Operation and recovery smooth. No incarceration of capsule or iris pillars in the wound. Vision = 20.40 +. In June, 1915, twelve years later, the patient returned with the report that the vision in the right eye had been failing for the last year or so. R. E. V. = $\frac{20}{70}$ +, fields contracted, tension 38*Hg*. The trephining was done over the site of the former corneal section. The fields and vision remained the same after the operation, but the tension was reduced to 10*Hg*.

In the group of chronic simple glaucoma, one case had a temporary return of tension in one eye. This patient, a woman forty-six years of age, had normal central vision, but the fields were very small and contracted almost to the fixation point. R. E. tension = 42*Hg*.; L. E. tension = 34*Hg*. The central vision remained normal, but the tension continued high and the fields lost in spite of active treatment with miotics. A sclerocorneal trephining was done on both eyes with a peripheral iridectomy. The operation and recovery were smooth. The central vision continued normal, the fields enlarged somewhat, and the tension continued low. On December 11, 1915, over a year after the operation, the patient's eyes were examined in the morning. R. E. tension = 11*Hg*.; L. E. tension = 6*Hg*. No miotic had been used for over a month. That same afternoon, the patient sewed with feverish haste for several hours, continuing into the twilight. That night she had an acute attack of glaucoma in the right eye. By the use of miotics, the pain ceased, but two days later, the tension was still 36*Hg*. On January 3d, twenty-three days after the attack, the tension was reduced to 20*Hg*. and is at present 19*Hg*. During this time, the tension of the left eye remained about 6*Hg*. The patient is doing incessant and close eye work, but the eyes continue in good condition. She is using a mild miotic in the right eye twice a day.

The second patient of this group unfortunately furnishes two eyes as examples of return of tension (after the lapse of some time), following a seemingly perfect sclerocorneal trephining. She is forty-eight years old, thin and frail-

looking but with much courage. Her father and one brother died from tuberculosis. Her mother died of throat trouble. One aunt had a tumor. The patient had suffered from pyorrhea, had never had any illness until the grippe five years ago. Occasionally anæmic, mitral stenosis, with good heart functioning; some auricular fibrillation; old, extensive, and probably latent, or inactive, pulmonary tuberculosis. The kidney elimination of phenolphthalein is low, 36% in two hours. Slight trace of albumin. Hæmoglobin 85%. Red blood cells = 3,816,000; white = 10,000. Wassermann negative. Blood pressure 135°–85°. She was first seen on February 18, 1913. She stated that the left eye had been failing for a number of years. Anterior chambers shallow, pupils moderately dilated. Marked cupping of both disks, atrophy being pronounced in the left eye. Fields of the right eye a trifle contracted, those of the left eye markedly so, superiorly and nasally almost to the point of fixation. R. E. V. = $\frac{20}{30}$; L. E. V. = $\frac{20}{30}-$. R. E. tension = 31*Hg.*; L. E. tension 42*Hg.* Miotics were used strenuously for over four weeks. The central vision remained the same, but the fields contracted. On June 24, 1913, the left eye was trephined with a small peripheral iridectomy. Operation and recovery were smooth. The central vision of that eye improved to $\frac{20}{30}-$, and the fields enlarged. The average tension was 15*Hg.* Colonel Elliot saw this eye when in Washington and used this patient to illustrate a case of perfect drainage after his operation. He also strongly advised a trephine upon the other eye. On December 30, 1915, this was done with a small peripheral iridectomy. The operation and recovery were smooth. In April, 1914, the patient had an acute contagious conjunctivitis in both eyes. She recovered without any complications. In May, 1914, R. E. V. = $\frac{20}{30}$; L. E. V. = $\frac{20}{30}-$. Fields enlarged. Tension in each eye 13*Hg.* On December 21, 1914, a year after the operation on the right eye, the tension of that eye rose to 36*Hg.*, the tension of the left eye remaining 17*Hg.* After using ½% solution of pilocarpine and hot applications every two hours for two days, the tension fell to 16*Hg.* It then gradually rose again varying from 36*Hg.* to 61*Hg.* During this period, the left eye (the one first operated upon) remained below 20*Hg.* On January 19, 1915, a second trephine was done on the right eye, to the temporal side of the previous opening; a small peripheral iridectomy was also done. Operation and recovery were smooth. The sight and tension remained satisfactory. The fields showed no further contraction. On December 8, 1915, nearly a year after the second trephine on the right eye, the tension of that eye again increased to 34*Hg.*, that of the left eye remaining

normal. On March 17, 1916, R. E. V. = $\frac{20}{40}-$; L. E. V. $\frac{20}{40}-$. R. E. tension = 43*Hg.*; L. E. tension = 36*Hg.* It will be seen that the left eye after perfect quiescence and drainage for three years (lacking three months) again ceased to drain properly. At this time, the eyes presented macroscopical anatomical changes. The anterior chamber became almost abolished in the right eye, and more shallow in the left; the translucent blebs, with uplifted conjunctival and subconjunctival tissue, practically disappeared and the trephine opening seemed to be occupied by a pigmentary deposit. At the same time, the site of the trephine openings, which originally seemed perfectly placed, gave the impression of having been located too far back, leaving a space of scleral tissue between them and the corneal margin. Whereas, in fact, in each case the drill overlapped well into corneal tissue. The fields which had increased during the freedom from high tension began to contract. A second trephine on the left eye was determined upon, and a third upon the right eye with a complete iridectomy through the trephine opening. This was done on April 18, 1916. In the left eye this was accomplished without difficulty, the aqueous immediately escaping after the trephine pierced the sclera. The iris ballooned into the wound and was easily excised. In the right eye, the operation was more difficult owing to the obliteration of the anterior chamber. The aqueous did not escape until the iridectomy was done. So far as the eyes are concerned, the recovery has been painless and smooth. However, on the ninth day after the operation, a cerebral hemorrhage occurred, causing a left hemiplegia. The patient, however, is improving and her eyes are soft and comfortable. I had hoped to show this patient to the Society.

The case of Mr. N., fifty-three years old, will be an illustration of the successful cases of this group. High degree of hyperopia; glaucoma simplex both eyes; R. E. V. = $\frac{20}{50}$; L. E. V. = $\frac{20}{100}$. R. E. tension = 33*Hg.*; L. E. tension = 57*Hg.* Fields markedly contracted nasally and above in left eye. December 3, 1912, Lagrange with iridectomy performed on left eye. For a year the tension with the use of miotics remained about 28*Hg.* It then gradually increased to 50*Hg*, the tension of the right eye going up to 43*Hg.* The patient has continually high blood pressure, at times as much as 280 *Hg.* On December 9, 1913, both eyes were trephined and an iridectomy performed on the right eye. When the trephine was completed on the left eye, the aqueous spurted through the top of the drill. There was much chemosis of the ocular conjunctiva of both eyes for five or six days after the operation. Mild iritis in the right eye, none in the left. R. E. V. = $\frac{20}{40}$; L. E. V. = $\frac{20}{40}-$.

Tension R. E. = 17−H_9.; L. E. = 7H_9. Fields improved. Patient exhibited.

Of this series, one patient had a rupture of the conjunctiva, over the trephine opening, eight months after the operation. This was repaired by a sliding flap of conjunctiva. One patient had marked vitreous opacities and incipient cataract. There has been no increase of the cataract since the operation two and one half years ago.

Of the twenty-seven eyes with glaucoma simplex, there has been a serious return of tension in two eyes (in the same person). I hope that this percentage in glaucoma simplex (7.4%) may be eventually reduced by the last operation.

The good results in the successful cases cannot be attributed to the iridectomy alone. For among my cases, five had undergone an iridectomy and four of them a Lagrange with iridectomy previous to the trephining. In all of these nine eyes, there had been only a temporary relief of tension, though a little drainage seemed to be still going on. Since the trephining, there has been no return of tension in any of these nine eyes.

In all of these cases, before resorting to operation, miotics were strenuously used in many cases of glaucoma simplex over a period of years.

The advent of the tonometer marks an era in the history of glaucoma. But I believe firmly that very careful palpation should be practiced even more than ever in order to verify the findings of the tonometer; for some of the newer instruments, in my own experience, have not proven themselves correct. My original Schiotz instrument is more reliable than any of the later models, and its measurements tally more closely with palpation and the clinical phenomena of glaucoma. It seems trivial to speak of the method of using the familiar tonometer, but the carefulness of that method cannot be too strongly emphasized. The patient should lie practically flat on the back and relax; holocain should be instilled several times; sufficient time should be allowed for complete local anæsthesia. When possible, an assistant should hold the lids back in order that the orbicularis may not alter the results by pressure on the globe. At least three weights should be used, and the instru-

ment manipulated with such deliberation that the surgeon may be able to take the mean of the systolic and diastolic intraocular tension as shown by the slight variation of the indicator.

But to return to the main subject.

Shortly after the introduction of this operation, it was written about and discussed with much enthusiasm. Now it seems as if the pendulum of professional opinion had a tendency to swing a bit too far in the other direction. The operation is objected to on the ground that synechiæ are apt to follow it. But that is also true of other operations used for the relief of tension, such as iridectomy and the Lagrange. A complete iridectomy at the time of the trephining, with the proper use of a mydriatic, will reduce this tendency. This operation has been condemned also because lenticular opacities have followed its performance. Cataracts in older people are apt to be associated with glaucoma, or glaucoma with cataracts. I have not seen any cataract caused by the operation, nor do preëxisting cataracts seem to increase with unusual rapidity afterwards. It is possible to cause a cataract by the drill, but it is also possible to cause it in other operations that are not skillfully performed.

Late infection has occurred with unpleasant frequency, according to most reliable reports. I believe that this danger can be lessened by taking great care to dissect up all of the subconjunctival tissue with the conjunctiva in order to make the flaps as thick and protective as possible. I warn my patients of the possibility of infection, and advise a boric acid solution to be used twice a day even when no miotic is used. I also give them directions, with necessary prescriptions for argyrol etc., for the care of the eyes in case of an acute conjunctival inflammation until expert advice can be obtained. Of course, prophylaxis is more difficult among the ordinary hospital patients.

Hemorrhages into the vitreous from the choroid, or the retina, have occurred in the hands of the most skillful operators. This danger can be lessened by using certain precautions before the operation, such as decreasing excessive blood pressure; reducing the intraocular tension by the strenuous use of miotics; avoiding a general anæsthetic and giving morphia

hypodermically (in suitable cases); the administration of lime salts in cases of delayed coagulation. However, intraocular hemorrhage is a danger in all procedures where the tension of the eye is suddenly reduced.

Relapses, too, do occur, as I know to my discomfort. But no procedure, surgical or non-surgical, is exempt from that calamity.

Weighed in the balance of my own personal experience, the operation of sclerocorneal trephining presents many advantages. Both eyes can be operated upon at the same time, and the patient does not have to be very quiet or very long confined. The operation can be done with ease, except in cases where the anterior chamber is abolished. It does not reduce the visual fields, therefore it can be done in those cases where the restriction is almost to the visual center. It has not immediately reduced vision in any case, but it has improved the sight in a number of cases. It has not caused astigmatism, to any accountable extent, and therefore it can be safely done where the vision is normal without any undue risk of immediate impairment of sight. There is only a negligible risk of the loss of vitreous and no danger of the escape of the lens. The operation may be repeated.

There is no ideal operative procedure. But in my limited experience, for permanently reducing excessive tension in all cases of glaucoma, except the acute form, sclerocorneal trephining is the easiest, safest, and most effective method so far presented to ophthalmic surgery.

REPORT OF CASES OF QUININE AMBLYOPIA, WITH REMARKS.[1]

By JOHN E. WEEKS, M.D., New York.

(With six figures in the text.)

ALTHOUGH quinine amblyopia is well known to all ophthalmologists, the cases here reported possess some features that in the opinion of the writer justify their being presented here.

Case 1.—Mrs. H. K., age 51 years. On January 19, 1916, the patient was operated on for fistula-in-ano and hemorrhoids while under a general anæsthetic. It was thought advisable to give twenty grains of quinine per rectum after the operation to control pain (as a nerve block) and a prescription was sent to a druggist. Instead of writing the prescription in troy weight it was written in the metric system as follows:

℞ Quininæ muriate 20.00
Aquæ 120.00

M. S.

—an amount equivalent to about 315 grains of quinine. The 120*cc* was injected well up into the rectum by means of a syringe and a soft rubber catheter. The solution was quite warm when the process of injecting it began, but cooled somewhat as the injection proceeded. As the preparation cooled, crystallization occurred because of over-saturation, partly clogging the catheter. Some of the preparation escaped from the rectum. Probably about one-half of the quinine was retained. The quinine was injected about 6.30 o'clock P.M. Some morphine had been given hypodermatically before the operation. Inces-

[1] Read at meeting of American Ophthalmological Society, Washington, 1916.

sant vomiting occurred from 9 P.M. to 1 A.M. The stomach was washed out with a solution of sodium bicarbonate, and one-thirtieth of a grain of strychnia sulphate was given hypodermatically some time before 6 o'clock A.M. on January 20th. At 9 A.M. the patient opened her eyes and inquired if there was a light in the room. Her physician became aware that vision was abolished at 10 A.M. At that time the pupils were dilated three-fourths maximum. Right iris was not responsive to light; left iris responded but almost imperceptibly. Vision nil. Patient complained of tinnitus and deafness. Blood pressure (systolic) 120. Heart action normal. Patient was seen by the writer at 2.15 P.M., twenty hours after the quinine had been given, who, after hearing the history, made a tentative diagnosis of quinine amblyopia which was confirmed on examination of the eyes.

Status præsens.: Pupil dilated. Reaction of irides to light and vision as at 10 A.M. Optic disks very pale; capillaries empty. Veins and arteries about two-thirds normal size. Volume of blood apparently not more than one-half the normal. Caliber of vessels uniform. Vessel walls transparent. Retina œdematous and pale throughout, except at the macula, the œdema being almost as dense at the periphery as in the other parts of the retina. There is no very well-defined "cherry red" spot, but there is very little œdema at the fovea centralis, this area having a brownish red appearance. Ocular motility normal. Patient prostrated by the nausea and vomiting and the effects of the anæsthesia.

The husband was very anxious to know the probable outcome regarding vision. He was informed that vision would return, but to what degree could not then be determined.

Treatment, which was instituted at once, consisted of a high copious saline enema (two quarts) repeated in two hours and again four hours later. This was advised in order to wash out any quinine that might have remained in the bowel. Glonoin gr. $\frac{1}{100}$ every three hours, for the purpose of relieving vascular spasm. Strychnia gr. $\frac{1}{40}$ three times daily (the glonoin and strychnia hypodermatically) as a sustaining measure.

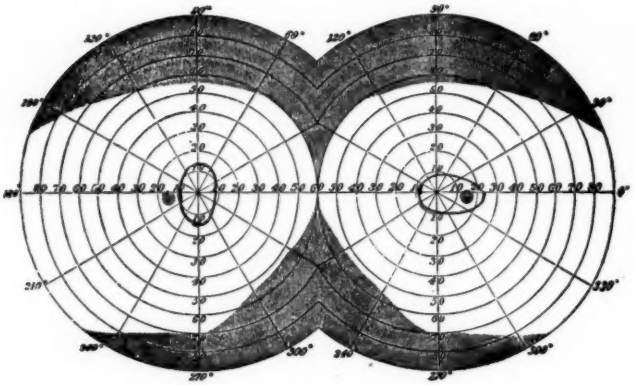
At five o'clock of the same day the retinal blood-vessels were not quite so small, and the œdema of the retina at the periphery was not so marked.

Jan. 21st, 8 A.M. No perception of light. Œdema of retina less marked. Three P.M.: Pupils react very slightly to stimulus of light. Patient can distinguish bright light, as the flash from an electric bulb. Eight-fifteen P.M.: Consultation with Dr. George E. de Schweinitz who suggested

giving digitalis in addition to the other remedies mentioned, with the idea of increasing the force of the blood current to some extent. Digipuratum was given in one grain dose three times daily.

January 22d, two o'clock P.M. Blood-vessels of retina appear to be a little larger. Periphery of retina clearing. Irides react more readily to stimulus of light. Can see hand movements.

January 23d. Sees to count fingers at four inches. Slight capillary flushing of inner-upper quadrants of disks. Retinal blood-vessels about $\frac{2}{3}$ normal size — regular.



CASE I—FIG. 1. H. K. Jan. 27, 1916.

Glonoin reduced to $\frac{1}{200}$ t.i.d. Digipuratum and strychnia continued.

January 24th. Digipuratum not well borne, discontinued. Glonoin discontinued.

January 25th. Urine examined qualitatively. Trace of albumin. No sugar, no casts. No trace of quinine.

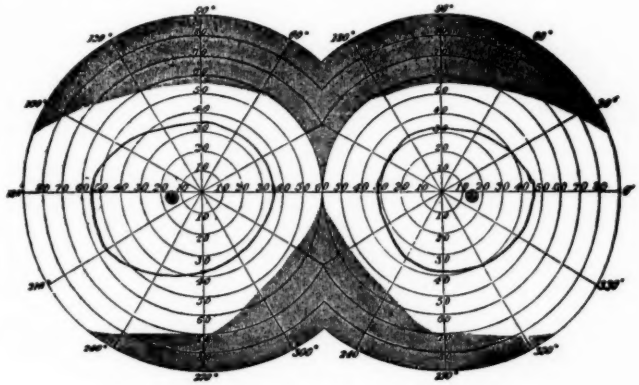
January 27th. Fields of vision taken. (See Fig. 1.) Sees colors correctly when in large surface. The margins of the retinal vessels show as narrow white lines.

January 30th. Vision R. E. $\frac{20}{30}$ —, L. E. $\frac{20}{30}$, central.

January 31st. Blood-vessels not so large as on January 24th. The strychnia and glonoin were renewed. The lumen of the arteries has become irregular, the walls of the arteries in particular appear to be irregularly thickened, this being apparent by a difference in the width of the bordering white lines.

February 2d. As the blood column in the retinal arteries

appeared to have diminished in size it was thought desirable to find some means to increase the blood flow, and in this quest Dr. Evan Evans, internist, was called in consultation. Dr. Evans expressed the opinion that it would be impossible to increase the blood pressure for any length of time, if at all, by any means, with a normally functionating heart, but suggested caffein in addition to the glonoin and strychnia (caffein gr ii, glonoin gr. $\frac{1}{100}$ given every four (4) hours, the strychnia as before). Some improvement in the size of the retinal blood-vessels followed and the irregularity in the lumen of the arteries slowly disappeared.



CASE I—FIG. 2. H. K. Feb. 26, 1916.

February 4th. Began to take the iodide of strontium for its effect on exudation. Both disks show an increase in the capillary circulation. Vision of each eye central $\frac{15}{20}$.

February 7th. Dr. O. Schirmer saw the patient in consultation and suggested massage by means of an electric vibrator to be applied once or twice daily. It was thought that the use of the vibrator might endanger the integrity of the eyes by inducing hemorrhage or detachment of the retina. As a substitute gentle digital massage was instituted.

February 13th. Condition of disks and retinal vessels better. The irregularity in the thickness of the walls of the retinal arteries has disappeared, the calibers now being uniform.

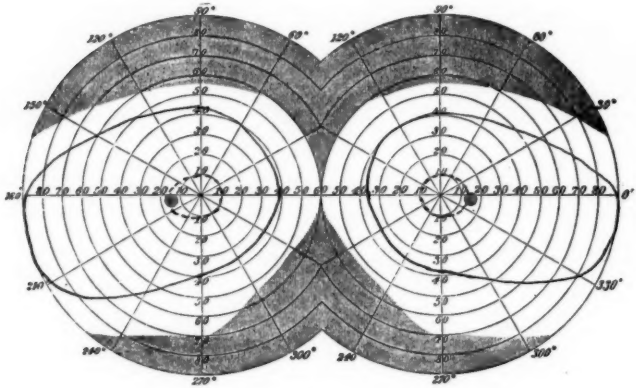
February 26th. Fields of vision as in Fig. 2.

February 29th. Dr. de Schweinitz who saw the patient

at his office reported the light perception as tested by Snellen's photometric letters to be 75%.

March 26th. The optic disks present about ⅔ normal capillarity. Arteries ½ normal size. Veins slightly narrower than normal. Fields of vision as in Fig. 3. Parinaud's photometric bars indicate a light perception of 80%. Vision $\frac{20}{200}$ — in each eye. Patient reads ordinary type readily.

April 10th. The patient's general condition is somewhat below normal. While her weight is normal, the patient becomes fatigued easily, suffers from insomnia, and is in a more or less depressed condition nervously.



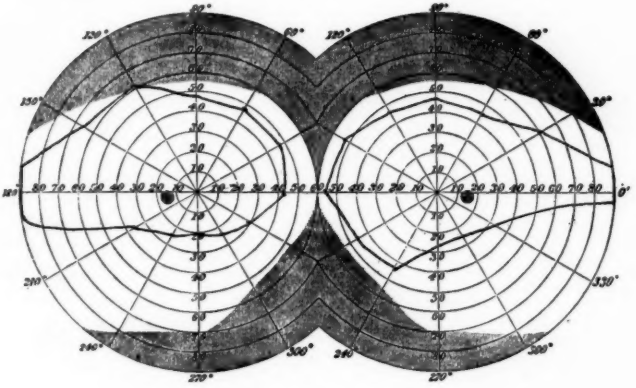
CASE 1—FIG. 3. H. K. March 26, 1916.

Throughout the entire progress of the case, since light perception began, the patient, while able to see objects, has complained that she "cannot see the light," apparently meaning that the light, particularly daylight, does not have the ordinary intensity. With virtually normal vision the patient continues to inquire, "When shall I see the light?" or "When shall I see daylight again? Everything is so dark." There does not appear to be any great amount of torpidity of the retina, as objects are almost normally visible when the light is modified, but if the light is considerably reduced the reduction in light perception causes her to lose form before it is lost to the normal eye. I am of the opinion that the phenomena that she so constantly complains of are due to the reduction in the light sense.

April 26th. Patient died from injuries received as the result of a fall.

CASE 2.—Miss Rose L., age 16 years, entered the hospital at the Rockefeller Institute, December 13, 1915, having developed pneumonia two days previously.

[The selective action of certain of the salts of quinine against the pneumococcus is now well recognized by clinicians. One of the most active is ethylhydrocuprin (optochin) produced by Zimmer & Co. of Frankfort, Germany. Studies have been conducted at the Rockefeller Institute recently to ascertain the therapeutic value of ethylhydrocuprin in the treatment of pneumonia. To January 31, 1916, eleven selected cases had been treated. Ocular symptoms developed in but one.]



CASE 2—FIG. 4. R. L. Feb. 13, 1916.

December 14th. Ethylhydrocuprin (optochin) was given by mouth in 0.5. gram dose repeated every eight hours until two grams were taken. The last dose was at 5 P.M., December 15th. At nine o'clock P.M. the patient complained that she could not see.

December 21st. Patient began to distinguish light. Vision slowly improved from this time until at the end of six weeks it equaled $\frac{20}{50}$ — in each eye.

January 27, 1916. By the courtesy of the physician in charge I was privileged to see the patient.

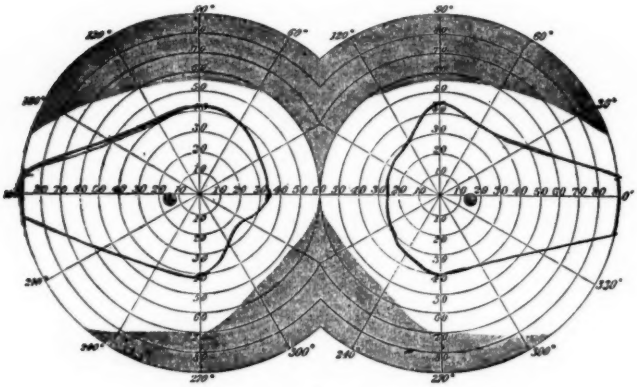
Status præsens. Irides react readily to the stimulus of light. Vision $\frac{20}{50}$ — in both eyes. Fields for form: Right eye above, 20°; below, 15°; nasally, 15°; temporally, 35°. Left eye, above, 25°; below, 25°; nasally, 20°; temporally, 35°. Optic disks paler than normal, but the pinkish flush (capillarity) was fairly well marked; veins

very nearly of normal size; arteries one-half the normal size; walls of blood-vessels thickened, showing as white lines bordering the blood column. The white lines, particularly along the arteries, were not of uniform width, causing the blood column to appear narrower at some places than at others.

February 13, 1916 (about two months after the ethylhydrocuprin was taken). Fields of vision for form as shown in Fig. 4.

The patient's general condition is excellent.

May 6, 1916. Vision of each eye $\frac{20}{30}$ —.



CASE 2—FIG. 5. R. L. May 6, 1916.

Fields of vision, as in Fig. 5, slightly reduced particularly to the nasal side from the field as of February 13th. Light perception approximately 80. Color vision very indefinite. Many of the retinal arteries are greatly reduced in caliber, their walls irregularly thickened, the optic disks considerably paler than usual, but not extremely pale. The condition of the retinæ does not seem to be as good as on January 27th.

CASE 3.—The following is a supplementary report of a case first reported by the late Dr. Herman Knapp in the ARCHIVES OF OPHTHALMOLOGY (vol. x., 1881, p. 220):

"Patient, Jennie L., age 6 years. Chill on the afternoon of April 3, 1877. April 4th, A.M., temp. 106¼,° pulse 150. Ordered quinine gr. x by rectum. At 9 P.M. ordered quinine gr. ii every hour by mouth. April 5th. Quinine by mouth having been rejected, has been taking it by suppository gr. x every four hours nearly.

"April 6th. Took ten grains of quinine by enema last night. Ordered ten grains of quinine to be given by rectum at noon. 4 P.M. restless. Pupils dilated, irides immovable. Vision abolished. More or less quinine given to April 10th.

April 11th. Patient saw sparks of fire from the open grate."

Dr. Knapp saw the patient for the first time February 16, 1878, almost a year after the quinine had been taken. He reports:

"When she presented herself to me, she was in good general health. She read easily Sn. xx at 20′, and 0.25 at 8″, with each eye, but showed a moderate concentric limitation of the visual field in each eye. Her color-perception was normal. The ophthalmoscope showed a striking picture: both optic disks white, the retinal vessels scant and very small, especially the arteries. The pupils were of normal size and mobility, the eyeballs of normal tension, showing nothing unusual in external appearance and mobility.

"On May 11, 1879, she presented herself to me again. Four months previously she had had malaria, and taken quinine again; no more, however, than ten grains one day. The parents had noticed that from that time her sight was impaired. I found S. $\frac{20}{100}$ in the right, and $\frac{20}{100}$ in the left. She read 0.50 with difficulty. No improvement with glasses. She was green-blind. Her field of vision was very much contracted; in the right eye almost to the point of fixation, in the left having a diameter of 15°, of which 5° were on the nasal, 10° on the temporal side, from the point of fixation. The optic disks were white; the blood-vessels, especially the arteries, few and very small. Patient had frequently suffered from headache.

"In May, 1881, while preparing this paper, I examined her again. Her sight was $\frac{20}{30}$ in each eye. Emmetropia. She experienced no inconvenience from her eyes in any way. Her perception of colors, tested with different methods—selection of samples, pseudo-isochromatic plates, contrast-shadows—proved perfect. Her light-sense was normal. She never complained of seeing less in the dusk than other people, and was able to read the same type as persons with good eyes, when I gradually obscured the examination-room. Her field of vision, however, was still contracted, and, measured perimetrically, showed almost symmetrical figures in both eyes.

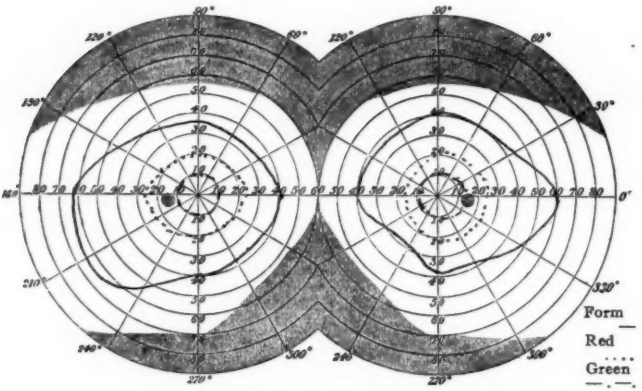
"The optic disks were white, with a faint pinkish tinge. Both arteries and veins were few and small, but none were white. The choroidal vessels, clearly visible, were normal in color, size, and distribution. The appearance of the fundus oculi, in general, was normal, with the exception

of the changes of the optic disk and retinal vessels, as described above."

The patient was seen by the writer on February 26, 1916, and on May 19, 1916.

A vertical nystagmus is present in both eyes. Vision with correction in right eye was $\frac{20}{50}$; left eye $\frac{20}{40}$ —. The fields of vision as in Fig. 6.

The optic disks are almost chalky white. The blood-vessels very few in number and very much reduced in size. The arteries in particular are very narrow. The walls of the vessels do not show very marked thickening. The



CASE 3—FIG. 6. J. L. May 19, 1916.

fundus in general presents the appearance that accompanies a reduced blood supply, not as vivid a reddish brown as is found in the normal fundus. It is evident that the nystagmus has developed since the patient was seen by Dr. Knapp thirty-eight years ago, and that the vision has deteriorated slightly. The fields of vision are reduced but little. The only symptom referable to a diminished light perception is experienced when passing from a well-lighted to a faintly lighted room, when although the irides are active some time is necessary for adaptation. On the whole it is remarkable that so little change has taken place after the long lapse of time.

In regard to the cherry-red spot. In the case of Mrs. H. K. the area of the fovea centralis, while it presented a reddish color on account of the absence of œdema at this point, did not

present the vivid cherry-red color so generally found in obstruction of the central artery of the retina, the reason for this being, if my interpretation is correct, an ischæmia of the choroid as well as of the retina, due to the effect of the quinine on the vessels of the choroid. The absence of a free flow of arterial blood in the choriocapillaris causing the appearance at the fovea to lose much of its vividness and to have a reddish brown color.

The tension in the three cases noted was normal.

In one of Roosa's (Knapp's ARCHIVES, vol. ix., p. 41) cases which he saw two years after the amblyopia occurred, the patient complained that she saw as though a veil was over her eyes—"cannot tell whether her linen is clean when it comes from the wash." Vision at this time = $\frac{20}{40}$ O. U. In our first case the complaint was not of a sensation as though she was looking through a veil but as though the light was not of sufficient intensity. Objects were not sufficiently well illuminated. This was on account of a 15 to 20% loss of light perception.

Treatment: Inhalations of nitrate of amyl, digitalis, strychnia, galvanism, hydrobromic acid, bromide of sodium, and the iodide of potash are remedies mentioned. Von Graefe depleted the patient. It would seem to the writer that the indications for treatment are first to relieve and to prevent vascular contraction. Remedies that will do this should be employed. Vigorous supporting measures in the way of diet and pure air should be instituted. For the first week or ten days after the amblyopia is induced it is probable that the recumbent position with the head low may be of value as favoring a greater flow of blood through retinal and choroidal vessels.

A CASE OF SYPHILITIC RETINOCHOROIDITIS JUXTAPAPILLARIS, WITH MICROSCOPIC EXAMINATION.[1]

By Dr. F. H. VERHOEFF, Boston.

(*With one illustration on Text-Plate XI.*)

(From the Massachusetts Charitable Eye and Ear Infirmary.)

THE term retinochoroiditis juxtapapillaris is certainly descriptive of the pathological condition found in the following case, although from an etiological standpoint the latter probably does not belong to the class of cases described by Jensen.

James S., a negro sleeping-car porter aged 28 years, was admitted to the Massachusetts Charitable Eye and Ear Infirmary, May 29, 1915. He stated that one week previous on arising in the morning he found that everything appeared misty when seen with the right eye. Two days later the eye became congested and painful and the sight much worse. No previous eye trouble. (Later patient stated that he struck his eye on a door knob on May 18th.) Patient denied venereal disease. (Later he admitted syphilis of tonsils as noted below.) His general health was excellent.

Examination: Marked pericorneal congestion. Globe tender to touch. Cornea clear. Pupil semi-dilated (atropine), regular. Anterior chamber normal in depth, clear. Lens clear. Vitreous filled with dust-like opacities, preventing clear view of fundus. Retina can be seen as an indistinct grayish white membrane everywhere separated. Tension normal. Visual acuity of right eye, light perception only, projection faulty. Left eye normal; visual acuity.

[1] Read at meeting of American Ophthalmological Society, Washington, May, 1916.

ILLUSTRATING DR. VERHOEFF'S ARTICLE ON "SYPHILITIC RETINO-CHOROIDITIS JUXTAPAPILLARIS."

Syphilitic Retino-Choroiditis Juxtapapillaris. Magn. x 8.

Treatment: Atropine sulphate 1% three times daily. Mercurial inunctions twice daily. Aspirin. Hot applications.

June 2d. Morphine required for pain.

June 4th. Wassermann test reported negative.

June 10th. Small hypopyon. Pain less.

June 13th. Hypopyon gone. Posterior synechiæ are now present although the pupil is still well dilated. No light perception.

June 16th. Vitreous very cloudy. Fundus not visible. Patient discharged against advice. Mercurial inunctions continued.

June 22d. Readmitted. Eye markedly congested. Cornea slightly hazy. Pupil irregularly contracted.

June 23d. Enucleation by Dr. Halliday.

June 28th. Patient stated for the first time that some months ago he was told at the Massachusetts General Hospital that he had syphilis of the tonsils, and that he was treated with salvarsan. From this hospital the following information has since been obtained in regard to the case:

The patient was first seen at the Massachusetts General Hospital, Feb. 25, 1915, when he complained of sore throat and swollen glands at the angle of the jaw. *Diagnosis:* Primary syphilis of left tonsil of one month's duration. No skin eruption. The patient was given .6*gm* of neosalvarsan and placed on mercurial treatment.

March 10th. Left tonsil still shows ulceration. Glands subsiding.

March 26th. .4*gm* neosalvarsan given. Mercurial treatment continued.

May 29th to June 28th, under mercurial treatment at Massachusetts Charitable Eye and Ear Infirmary (as noted above).

July 23d. Posterior surface of right thigh shows typical circinate lesion. Scattered papules on penis and scrotum. Mercurial treatment continued.

August 9th. Small patch on tip of tongue.

August 31st. Lesion on lower lip.

October 16th. Lesion on lip gone, but patches on tongue, tonsils, and anterior pillars persist. Salvarsan given.

November 19, 1915. No signs of active process in mouth.

Pathological Examination (Path. Rec. 3–2788): The globe is normal in size and shape and the cornea is clear. The anterior chamber is normal in depth and filled with serum. The lens is *in situ*. The pupil, 3*mm* wide, is blocked by delicate membrane. The root of the iris is adherent to the ligamentum pectinatum for about 1*mm* all around.

The vitreous is coagulated, after fixation, into a firm semi-opaque mass. Near the posterior pole of the eye the retina shows a localized oval area of thickening about *7mm* in diameter, which includes the disk and extends about *1mm* beyond it. The center of the lesion is thus not in the disk but in the retina above and to the outer side of the disk where no doubt the lesion originated. In the affected area the retina in places reaches a thickness of *2mm* and is adherent to the choroid. Everywhere else the retina is separated *1mm* to *5mm* from the choroid by serum, and shows numerous hemorrhages. On the temporal side the outer surface of the retina is coated with a thick layer of blood. The choroid beneath the retinal lesion is *1.5mm* thick and gradually returns to its normal thickness within an area *16mm* in diameter.

Histological Examination: Fixation for forty-eight hours in an aqueous solution containing formalin 1%, alcohol 52%, and phenol 5%. Part of the affected retinal lesion prepared by the Levaditti method. Horizontal sections through the middle of the retinal lesion and optic disk. Staining by a variety of methods.

The chief pathological process in the eye has to do with the localized lesion involving the retina and disk. Within the area of this lesion the normal structures have been almost completely replaced by granulation tissue richly infiltrated with chronic inflammatory cells. The granulation tissue extends just through the lamina cribrosa but does not invade the nerve stem. The cellular infiltration consists mainly of plasma cells but lymphocytes are also abundant; only a few eosinophiles and pus cells are present. There is marked venous congestion, and here and there interstitial hemorrhages and blood pigment are seen. The inner surfaces of the retina and disk are in most places intact, but just to one side of the disk the surface of the retina has been broken through by an exuberant growth of granulation tissue which is pushing its way into the vitreous. This is coated with blood and fibrin

The blood-vessels in the disk and affected portion of the retina show marked proliferative endovasculitis, especially the arteries. A main branch of the central artery is almost completely obstructed by endarteritis and farther on is thrombosed. Many of the smaller vessels contain fibrinous thrombi, some of which are infiltrated with necrotic cells. Still other thrombi contain hematogenous pigment and show advanced organization.

The retina away from the lesion proper is everywhere more or less necrotic and shows numerous hemorrhages some of which extend into the vitreous or more often into the

subretinal space. The outer surface of the retina is coated with fibrin.

The nerve stem shows marked venous congestion, interstitial hemorrhages, and dense perivascular infiltration with lymphocytes and plasma cells. The central vessels up to the lamina cribrosa are almost free from endovasculitis. The artery, however, shows here and there a few fatty endothelial cells in the intima.

The choroid beneath the retinal lesion is highly congested and greatly thickened by œdema and infiltration with plasma cells, but it has not been invaded by granulation tissue. The pigment epithelium has been separated from the membrane of Bruch by a layer of plasma cells, and is partly disintegrated. The membrane of Bruch, however, is for the most part intact, but in a few places has been broken through. The infiltration of the choroid rapidly diminishes and entirely ceases at a distance of about 1*cm* from the disk all around.

The vitreous body is infiltrated with serum throughout. Anteriorly it is relatively clear, containing only a few lymphocytes and a considerable amount of fibrin evidently given off at the ora serrata. Posteriorly, it contains masses of necrotic cells apparently derived from the retina, much fibrin, and many fresh pus cells.

The cornea is normal. The tissue of the limbus is congested and moderately infiltrated with lymphoid cells. On the posterior surface of the cornea there are occasional single lymphoid cells but no clumps of cells. There is no trace of hypopyon.

The root of the iris is firmly united with the ligamentum pectinatum. The anterior surface of the iris is coated with a thick vascularized membrane. This does not intervene between the root of the iris and the ligament, but continues over the lens surface. The pupillary margin of the iris is united to the lens. The iris stroma is congested, but not swollen, and contains only a very moderate number of chronic inflammatory cells. The lens is normal.

The ciliary processes are giving rise to a slight exudation of lymphoid and pus cells, but otherwise the corona ciliaris is almost normal. The orbiculus ciliaris, however, is markedly altered. It is greatly infiltrated with lymphoid cells and its epithelium is being disintegrated by granulation tissue springing from its surface. The granulation tissue is thickest at the ora serrata. Here its free surface is richly vascularized and it is actively proliferating into the vitreous, but it does not appreciably involve the choroid.

Bacteriological Examination: Sections stained by the Levaditti method, by the Gram method, in carbol-thionin,

and for tubercle bacilli, are all negative for microörganisms. (It is probable that the fixative employed was not suitable for the Levaditti method.)

The important features of this case may be briefly summarized as follows:

A man aged 28 years developed primary syphilis of the left tonsil and was treated at a general hospital with neosalvarsan and mercury for about one month. At the end of this time the tonsil was much improved and the patient discontinued treatment. About two months later the patient for the first time noticed that the sight of one eye was blurred, and one week after this the eye became painful, and there were found slight iritis, abundant fine vitreous opacities, and separation of the retina. A Wassermann test was negative. In spite of mercurial inunctions twice daily for three months the inflammatory condition of the eye and the pain continued to increase and the eye became totally blind and was removed. On pathological examination there was found a granulomatous lesion centered near the margin of the disk which involved chiefly the inner layers of the retina and only secondarily the disk and choroid. About three weeks later definite secondary syphilitic lesions of the skin and mouth had developed. After a further course of mercurial treatment for four months all the lesions had healed.

This case in many respects was not unlike a case of syphiloma of the optic nerve and papilla previously recorded by me, in which there was likewise marked inflammation of the anterior part of the eye and great pain. The lesion, however, was centered in the nerve stem and involved the disk and retina secondarily. In this previous case I was fortunate enough to be able to demonstrate an abundance of spirochætes in the lesion, and it seems to be the only case of its kind in which these organisms have been demonstrated.

In the present case, the history of contusion of the eye, which was given as an afterthought by the patient, is of questionable significance, although it seems possible that the blow may have determined the localization of the retinal lesion.

Retinochoroiditis juxtapapillaris was first described as a clinical entity in 1909 by Jensen, who reported four cases. According to his description the affection occurs in healthy

young persons without evidences of syphilis or other constitutional disease. Ophthalmoscopically there is seen a light prominent infiltrate immediately beside the papilla, oval in form, and about the size of the papilla. The retinal vessels within it are partly or wholly obscured. The choroid is also affected as evidenced by vitreous opacities. The rest of the fundus is normal. The subjective symptoms consist in the blurring of vision due to the vitreous haze, and in a sector-like defect in the field extending from the blind spot to the periphery. In the course of a few months, the infiltrate begins to absorb from its periphery, finally leaving a pigmented white spot as in the case of any retinochoroiditis. The vitreous opacities also disappear. After several years recurrences may take place in the same area. In none of Jensen's cases was central vision affected.

Since Jensen's report, nineteen other cases have been recorded in the literature, but no further light has been thrown on the etiology. Jensen contended that the scotoma was due to the cutting off of the blood supply of the affected area. Groes-Petersens, however, and subsequent observers, give good reasons for believing that it is really due to destruction of the nerve fibers in the retinal infiltrate. Petersens also described two cases in which pigmentary changes were present in the macula of the opposite eyes, and van der Hoeve has recently reported a case in which such changes were present in the macula of the same eye and pointed out that in six of the twenty-five eyes of the reported cases central vision was permanently impaired. He also combined all the fields of these eyes and found that the upper-outer quadrant always escaped. Still more recently Rönne has reported two cases in each of which the sector defect in the field involved the upper-outer quadrant. In one of these cases there were two fresh infiltrates away from the macula and disk, and old macular changes in the other eye. In the other case there were precipitates on the back of the cornea. Thus far no eye affected with this disease has been examined microscopically. . It will be seen that the present case was similar to Jensen's cases in the situation of the retinal lesion, in the fact that the latter was solitary and affected most severely the nerve-fiber layer, and in the occurrence of vitreous opacities. It differed

from his cases in the far greater intensity of the process, in the occurrence of inflammatory changes in the anterior part of the eye, and in the existence of positive evidences of syphilis. It is evident, however, that if the case had been of a milder type and the retinal lesions had ultimately healed, the condition probably could not have been distinguished from Jensen's retinitis. The iritis and other inflammatory changes in the anterior part of the eye were clearly due to toxins diffused through the vitreous from the retinal lesion, and in a mild case would not have occurred.

It therefore seems possible that some of the cases reported as instances of Jensen's retinitis were syphilitic in origin. In favor of this assumption also is the tendency of Jensen's retinitis to recur in the same place. That the majority of cases of this kind, however, are syphilitic in origin is improbable. More likely they are due to an unknown infectious agent which tends to produce single foci in the choroid or retina. When one of these foci occurs in the retina at the disk margin the condition is classified as Jensen's retinitis. When it occurs elsewhere, as probably it more often does, the condition is regarded simply as chorioretinitis due to some unknown cause.

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THE OPERATIVE TREATMENT OF PARTIAL STAPHYLOMA OF THE CORNEA AND OF FISTULA OF THE CORNEA WITH A CONJUNCTIVAL FLAP, CONJUNCTIVO-KERATOPLASTY (KUHNT).[1]

By Dr. ARNOLD KNAPP, New York.

Case 1.—*Partial corneal staphyloma; recurring attacks of glaucoma and iritis; excision of staphyloma; conjunctivo-keratoplasty. Result: The new scar subsequently became slightly ectatic and boggy and the increased tension returned.*

C. H., aged 14, after a perforating corneal ulcer in the left eye in November, 1911, developed a circumscribed ectatic scar measuring 4½*mm* vertically and 5½*mm* horizontally, below and nasal from the corneal center. At one point in the scar there was a translucent area where iris tissue presented and rupture occurred from time to time with each attack of glaucoma. The iris was adherent except up and out where an iridectomy had been done. S = $\frac{8}{200}$.

An operation was decided upon to safeguard the eye from these attacks of glaucoma and from the inflammation which followed the perforation, and was performed on October 13, 1914, under ether narcosis. A conjunctival flap was prepared from the lower sclerocorneal margin. The ectatic corneal scar was cut away flush with the corneal surface and the iris was freed with a spatula. The conjunctival flap was drawn in place and anchored by sutures at each extremity.

The subsequent healing was uneventful; a tight bandage was constantly applied, the flap healed firmly in place, the anterior chamber was soon restored, and there was no cataract. The tension remained down, except on a few occasions when eserin had to be given.

On November 11th and 14th the extremities of the con-

[1] Read at the meeting of the American Ophthalmological Society, May, 1916.

junctival flap were divided. On November 23d tension was distinctly increased; it looked as if section of the pedicles had shut off a way of filtration for the aqueous. The conjunctiva over the corneal scar was œdematous and boggy; at its upper margin there were a number of small transparent vesicles. To reduce the tension a cyclodialysis was done at the upper and outer quadrant at the site of the old iridectomy. This reduced the tension for several weeks and the scar became flat and the vesicles disappeared. December 12th: the scar was again bulging and there were some deep vessels running to it from the periphery of the cornea. The increased tension has been readily kept down by massage. February 30, 1915: the scar was flatter, though the lower margin overhung the neighboring cornea. It was distinctly œdematous and could be indented with a probe. The tension seemed normal. April 27th: the condition had not changed, though possibly the area of the scar was somewhat more prominent. Tn. The lower half of the ectatic scar was diminished by the excision of a superficial crescentic piece of tissue. August 31st: the scar was somewhat smaller, though it still bulged like a cyst. December 13th: the scar was boggy, the vessels were distinctly to be seen running into the scar from the lower corneal margin; the tension was raised. March 25, 1916: the ectatic scar measured 5½ x 5; and was elevated 1½*mm*. T + 1. The scar was œdematous and it could be pitted. An anterior capsular cataract had developed. The eye was free from irritation and caused no discomfort. The main objection was the unsightliness of the circumscribed opaque protrusion on the cornea.

CASE 2.—*Partial staphyloma of the cornea; repeated perforation after attacks of glaucoma; excision of staphylomatous part; iridectomy; release of adherent iris; conjunctivo-keratoplasty. Result: A perfectly flat and firm scar with no return of increased tension or irritation.*

L. G., aged 14, seven years ago suffered from a corneal ulcer. During the past three years had three attacks of acute glaucoma. Three days ago another attack. At the time of the first visit to the Herman Knapp Memorial Eye Hospital, on June 20, 1915, an adherent leucoma occupied a lower quadrant of the cornea. This part of the cornea was replaced by a thin and ectatic scar with several translucent spots. T + 2. S = H. M.

Operation July 2d, under ether narcosis. A flap of conjunctiva was detached along the outer margin of the cornea. The staphylomatous area was excised. The attempt to free the iris on each side and to divide it horizontally with a scissors was only partly successful. An iridectomy was

done above. The flap was adjusted and held in place by sutures.

July 16th: no reaction; the flap was in place and had attached itself. It was divided above. September 22d: the cornea was flat, the area of the old staphyloma was covered with a flat conjunctival scar. There was no cataract. Tn. The eye was white and had been perfectly comfortable. February 11, 1916: cornea flat. Tn. S = H. M.

CASE 3.—*Corneal fistula; adherent leucoma; recurring attacks of glaucoma; iridectomy; curettage of the fistulous tract; conjunctivo-keratoplasty. Result: Fistula healed, tension normal.*

J. L., aged 30, twelve years ago suffered from an ulcer of the left cornea. Has had many attacks of increased tension which were relieved by perforation. V. = $\frac{1}{200}$. There was a deep glaucomatous cup. In the outer half of the left cornea there was a small round, slightly bulging scar with a central dark spot, consisting of iris tissue.

Operation March 16, 1915, local anæsthesia. An iridectomy was done at the temporal margin of the cornea, so as to include the iris, which was adherent to the cornea at the site of the corneal fistula. A broad spatula was then introduced into the anterior chamber, and with this as a background the fistulous tract in the cornea was curetted right down to its base. A conjunctival flap was taken from the outer margin and drawn over to cover the fistula where it was firmly pressed into the fistulous opening and held in place by sutures at the sclerocorneal margin.

March 25th: the flap had adhered to the corneal ulcer and was divided below. Two days later this was repeated above. The fistula was perfectly closed and the tension was normal. November 26, 1915: the cornea was firmly healed; tension 16; the eye was perfectly comfortable.

Partial staphyloma of the cornea when complicated with glaucoma and attacks of iridocyclitis is one of the most difficult problems which confront the ophthalmic surgeon. Either sight is lost from glaucoma, or the patient is subjected to repeated and painful attacks of congestive glaucoma which are relieved by perforation and escape of aqueous, when the danger of a secondary infection and purulent iridocyclitis is present. The only method of treatment which offers some prospect of success consists in excision of the staphylomatous portion of the cornea, in release of the adherent iris with iridectomy, and in covering the defect with a double pedunculated conjunctival

flap as particularly recommended by Kuhnt. The excision of the staphyloma and the conjunctivo-keratoplasty are relatively simple procedures, but the restoration of the normal intra-ocular tension is the difficult step and the one upon which the success of the keratoplasty depends. The difficulty of curing a glaucoma secondary to an anterior adhesion of the iris in conditions of adherent leucoma is well known. The important factor in the relief of glaucoma in these cases, to my mind, is the time at which the iridectomy is performed,—taking for granted that the iridectomy is complete and peripheric,—as in old and confirmed cases operations are generally not successful. If the tension is not reduced, the result of the keratoplasty may be like the condition described in the first one of my cases. The new scar, though thick, bulges and becomes œdematous and boggy as if the aqueous was finding a means of escape through it. Kuhnt (*Z. f. A.*, vol. xxiv., p. 19) has observed this in a number of cases of conjunctivo-keratoplasty and regards it as due to the fact that the corneal surface of the conjunctival flap did not heal promptly and that the aqueous constantly penetrated into it. He has therefore modified his procedure in these cases by not excising the entire part of the ectatic corneal scar but removing only the superficial layers and making a linear cut in the deeper layers with a knife. This thin layer of tissue, he believes, is sufficient to keep the aqueous from penetrating the flap. In a later article (*Z. f. A.*, vol. xxiv., p. 517) Kuhnt says that his original method, consisting in excision of the staphylomatous part of the cornea, conjunctivo-keratoplasty, and iridectomy, is only applicable for early cases. For older and extensive cases he resects a crescent from the periphery of the ectatic corneal scar after removing the anterior layers, sutures this to the adjoining corneal or scleral margin with catgut, and covers it with a conjunctival flap.

I believe that in my first case the increased tension was not corrected because the iridectomy had not been done early enough; the iridectomy was performed about one year after the perforating ulcer of the cornea, and that was two years before the patient came into my hands. At the time of the keratoplasty I neglected to do a tension-reducing operation, and did not obtain a satisfactory corneal scar. I shall make

another attempt to reduce the glaucoma with a scleral resection operation and to reduce the size of the thickened flap with partial excision or with the galvanocautery. In my second case a thick, flat scar replaces the previously thin, ectatic one, and the tension of the eye is normal; this satisfactory result was obtained principally because the iridectomy relieved the glaucomatous condition. I am firmly convinced that generally the iridectomy is not done early enough in cases of perforating ulcers of the cornea which are likely to be followed by glaucoma from the extent of the anterior iritic adhesions. I believe that the iridectomy should be done just as soon as the inflammatory conditions in the cornea permit, and that it is a mistake to wait until the intraocular tension is increased.

The relief of a fistula of the cornea is a simpler condition and one more amenable to operative treatment. The procedure which Kuhnt recommends (*Z. f. A.*, vol. xxxii., No. 6, 1914) and which was followed out in the above case, was simple and gave a perfect result. Kuhnt (*l. c.*) has reported on nineteen cases of corneal fistulæ which he has operated upon with conjunctivo-keratoplasty; of these, sixteen were cured, in three a second operation was successful, made necessary by a displacement of the conjunctival flap.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By LEWIS W. CRIGLER, M.D., Secretary

GEORGE H. BELL, M.D., CHAIRMAN. MONDAY EVENING, FEBRUARY 21, 1916

Dr. JOHN E. WEEKS presented a case of **unilateral ophthalmoplegia totalis.**

Patient, female, age 55, gave a history of periodic attacks of headaches and vomiting for the past year. Eight days ago severe headache developed on right side which lasted three days, followed by drooping of right lid.

Examination revealed a complete paralysis of both intra- and extra-ocular muscles of the globe, including the levator palpebræ. The lids were slightly swollen and the conjunctiva congested. The globe was pushed forward 2.5*mm*. The eye was otherwise normal except vision was only $\frac{20}{60}$. Nasal examination and serological tests were negative. Dr. Dixon reported that skiagraphic examination revealed the presence of a suspicious-looking shadow on the right side appearing to be behind the orbit or in its posterior portion. Apparent loss of bone in the right greater wing of the sphenoid and base of pterygoid. Diagnosis: Probable neoplasm involving all of the structures that pass through the sphenoidal fissure into the right orbit.

DISCUSSION: Dr. BROUGHTON said that he had had a similar case due to sinusitis which got well after operation, and although there was no apparent trouble in the nerve or fundus, vision did not return.

Dr. LESZYNSKY thought that the condition was one of syphilitic exudation.

Dr. DUANE presented for Dr. J. W. WHITE a case of **high**

astigmatism and anisometropia successfully corrected by glasses. Vision in the more astigmatic eye was raised from $\frac{2}{200}$ to $\frac{20}{30}$ by a cylinder of 9 D. The case was interesting because (a) of the ready acceptance of this high cylinder and of the anisometropic correction in an adult; (b) the fact that the astigmatism was regular and largely lenticular; (c) the ease with which the fundus could be seen by the direct method, if the examination was made with the patient's astigmatic glasses on. Dr. Duane had tried in this case Bellarminoff's method of examining the eye with the corneal refraction eliminated by putting against the cornea a plane glass wet with salt solution.

Dr. Duane also presented for Dr. White a child of 10 in whom a **marked vertical deviation,** due to paresis of the **left superior rectus** had been relieved by a tenotomy of the **right inferior oblique**.

In discussing Dr. Duane's case of high astigmatism, Dr. WEEKS referred to a case in his experience where a physician had had his glasses driven into his eye followed by prolapse of iris in two places; after excision and healing, the cornea showed 12 diopters of astigmatism. With a−2.00 sph.−10 cyl. vision was $\frac{20}{30}$, binocular single vision was obtained and the patient wears the glasses with comfort. There was only one half diopter of astigmatism in the other eye.

Dr. Duane said that it had been his experience that if the proper care were exercised in fitting and centering of lenses the majority of cases would wear their correction with comfort, even in very high degrees of astigmatism.

Dr. LINN EMERSON showed a case in which there was a **pterygium** on each eye that had extended so far into the pupillary space as to reduce the vision in the right eye to $\frac{2}{200}$, and in the left eye to $\frac{12}{200}$.

Dr. Emerson also showed a boy of twelve years of age with an **intraocular growth** of more than three years' duration, the character of which he had not been able to determine.

DISCUSSION: Dr. WEEKS asked if a subcutaneous tuberculin test had been made. Dr. Emerson replied that there had not. Dr. Weeks thought the case one of tuberculosis of the choroid. The condition is now so far advanced that the eye should be removed.

Dr. WIESNER presented several interesting cases of **trachoma**. One patient showed a condition in which the conjunctiva had returned to its normal condition without cicatrization with a persistent pannus. Another, marked papillary hypertrophy with numerous follicles as well, and a persistent pannus. Another in which the lids passed through the stages of inflammation, ulceration, and cicatrization with complete arrest of the disease, without arrest of the pannus. The fourth was one in which cicatrization, active inflammation, and pannus, with marked secretion, were all present at the same time.

DISCUSSION: Dr. CLAIBORNE suggested that the last named case was a suitable one for the combined removal of the cartilage and palpebral conjunctiva.

Dr. COHEN thinks Dr. Wiesner's second case one of inclusion-cell conjunctivitis, and his first case one of keratoconjunctivitis.

Dr. MARTIN COHEN presented several cases of **inclusion-cell conjunctivitis** shown at a previous meeting. The object in showing these cases repeatedly is to show that they do not follow the course of true trachoma; that is, they do not develop pannus, nor is there ever any scarring of the conjunctiva. The lids eventually return to normal.

Dr. ARNOLD KNAPP presented a patient with **iridochoroiditis, occlusion of the pupil, and zonular opacity of the cornea in both eyes,** upon whom a cataract extraction had been done. The patient, age 18, stated that her eyes became inflamed at the age of 10. When first seen, a year ago, she presented the condition described in the title, with normal tension and normal projection.

The case is of interest on account of the ability of eyes which had undergone so serious an affection to stand the cataract operation. She has now in the right eye vision of $\frac{20}{60}$ and in the left eye $\frac{20}{200}$.

The case is also of interest on account of the condition of the fundus, which is easily seen in the left eye, where the cataract came out in the capsule. The optic nerve is somewhat atrophic and surrounded with irregular pigmentation; the arteries are scarcely visible, the veins are normal. Along the larger blood-vessels at the posterior pole are large irregular pigment deposits. Some of these are exactly in the macular

region. In the periphery there are extensive chorioretinal changes.

Though the Wassermann test was negative, the condition is regarded as one of inherited lues.

Dr. OTTO SCHIRMER presented a case on which he had operated for the relief of a **traumatic coloboma of the upper lid.** The injury occurred five months ago and the whole upper lid was split in its central part. Although sutured the same day, a coloboma persisted which, even when the lids were closed, gave entrance to wind and dust and made it impossible for the patient to work.

In order to obtain a perfect and tight closure, Dr. Schirmer split the two central thirds of the injured lid into an anterior and a posterior layer and excised from each a triangular piece containing the scar. The skin triangle was excised more temporally, the tarsus triangle more nasally. Each layer was sutured separately, beginning with the inner layer from the transitional fold.

Dr. THOS. H. CURTIN presented a case of **retinal detachment relieved by trephine operation**. This patient was presented before the Section in January, 1915, as a case of retinal detachment with apparent cure following operation, with the following history:

Mr. B., a bookkeeper, age 21. Family history negative. On September 22, 1914, he noticed a blurring of the sight of the left eye. September 26th he visited a hospital without receiving treatment. Dr. Curtin saw him on October 1st. No history of trauma; urinalysis, Wassermann, and tuberculin test negative. B. P. 128. Vision in right eye $\frac{20}{40}$; in the left, hand movements in the lower and outer field. There was slight myopia in each eye. The left eye showed a large detachment in the lower and outer quadrant. The retina was bluish white and thrown into folds. The blood-vessels showed absence of light reflex. The disk was visible but the detachment extended almost to the macular region. There were a few opacities in the vitreous. He entered the hospital on October 2d and was put to bed. Atropine was instilled and a pressure bandage applied. Pilocarpine sweats were given every second day. October 12th, no improvement being noted, operation was decided upon. Under cocaine anæsthesia, a

button of sclera *2mm* in diameter was removed under the conjunctival flap over the detachment, as far back as possible between the external and inferior recti muscles. The choroid and retina were not punctured. The conjunctival flap was united by two silk sutures and a moderate pressure bandage applied. He was kept in bed until October 22d. There was moderate reaction following the operation. On October 22d, 25 drops of serous fluid was withdrawn by means of an aspirating needle, through the previously made trephine hole.

The fundus of the eye was immediately examined and the retina was found to be in place. The patient was returned to bed and kept there until November 4th. Vision on the following day was, fingers at eight feet. There was practically no reaction and vision gradually improved. On November 16th, his vision and refraction were as follows: Right eye, $\frac{20}{40}$; $\frac{20}{20}$ with a minus 1.50 cyl. axis 180°; left, $\frac{20}{70}$; $\frac{20}{40}$ with a minus 1 cyl. axis 180°. December 22d: vision in the left eye was $\frac{20}{30}$. January 27th: vision was $\frac{20}{20}$ with a minus 1.50 cyl. axis 180°. Vision is still normal with the above correction.

Externally the eye is normal in appearance, except that at the lower and outer part of the globe can be seen a small bluish circle, the site of the trephine opening.

Ophthalmoscopically the retina is entirely reattached except in a small area in the lower and outer quadrant which is probably the site of the scleral opening. A few small white striæ can be seen near the lower macular region, the former site of the detachment.

There are a few floating opacities in the vitreous.

The visual fields for both form and color are normal.

The case is presented as complying with the three requisites for the cure of retinal detachment, namely:—first, reattachment, second, restoration of vision and fields, and third, recovery lasting more than a year.

Dr. THOMSON said that a good many successful cases had been reported but not enough yet to determine just how great the chances are for success. Recent and traumatic detachments offer the best prognosis. It is important that the fluid be withdrawn with as little disturbance of the

eye as possible. The reattachment is immediate. It may be necessary to repeat the process.

Dr. LEWIS W. CRIGLER presented a case of a man, age 50, from whose left eye the lens had **extruded through a 2mm trephine hole.** The operation was done for the relief of secondary glaucoma (probably dislocation of lens) due to a blow sustained six weeks previously. There was slight loss of vitreous at the time of operation. A buttonhole iridectomy was also done at the time of operation. The whole lens was found in the lower cul-de-sac, the conjunctival flap drawn down over the cornea, and a large prolapse of iris presented at the first dressing. The patient was immediately anæsthetized, the prolapsed iris incised, pillars replaced, and the conjunctival flap sutured in place. The man made an uneventful recovery and his tension has remained normal up to the present time. A large detachment of the retina could be seen as soon as the inflammatory symptoms subsided, which is responsible for the reduction in vision, which is now fingers at one foot.

Dr. E. S. THOMSON said that he had had a similar experience but his patient was only 17 years of age. The lens was recovered from the lower cul-de-sac in its capsule.

Dr. Thomson said that he could understand how it was possible in his case, but it was hard to explain how such an accident could occur in a man 50 years of age.

Dr. H. H. TYSON presented a case of **eclipse amblyopia**. Male, age 42 years. On February 3d viewed solar eclipse with naked eyes. Shortly afterwards noticed an appearance resembling a large red ball in front of eyes, which lasted for some time. Later, on attempting to read, he noticed an inability to see clearly, especially, small print. He consulted his family physician who noticed the peculiar appearance of the retina and referred him to Dr. Tyson who on ophthalmoscopic examination saw a small gray circular disk of exudation about *2mm* in diameter at the maculæ of both eyes, resembling an optogram of the sun. There was a central scotoma with contraction of the visual fields. Vision in right eye with correction: $\frac{20}{60}$; left $\frac{20}{40}$. With stenopaic aperture vision was $\frac{20}{200}$ in each eye.

Sodium iodide was given until the disappearance of the exudate, when strych. nit. was given. Present vision $\frac{20}{20}$.

Patient has rapid retinal fatigue. Prognosis favorable. Dr. Tyson called attention to the fact that the prognosis is usually bad in cases similar to this one where the burn is supposedly a severe one, as evidenced by the large amount of exudate at the macula.

Dr. DUANE said that these cases cause a good deal of disturbance although vision remains good, due to a small central scotoma. Metamorphopsia is also often a disturbing element. There may be no apparent retinal change and still the symptoms remain.

Dr. E. S. THOMSON saw a case similar to Dr. Tyson's, eighteen years ago. He saw the case three months after onset. Appearance slight variation from normal; partial scotoma, metamorphopsia, and retinal fatigue were the conditions present at that time. Vision was $\frac{20}{30}$.

Dr. Shirmer saw a case a few days ago. There were very slight fundus changes. Vision right eye, $\frac{20}{20}$, left, $\frac{20}{30}$. Patient complained of blurred vision. Could read J. No. 1 with each eye. Could see test object $1\frac{1}{2}mm$. There was diminished color perception in the macular region, evidenced by the fact that the patient could discern a $1mm$ red disk when looked at over white, but not when looked at over black.

Dr. Tyson said that the stenopaic slit or disk was an aid in detecting central scotoma for distance, and that small numbers were best for the near point, because of the fact that one number in a group does not suggest another, as is the case in words, where if one or two letters are seen the others are anticipated.

Dr. DUANE reported for Dr. PYLE a condition to which he gave the name **subepithelial corneal membrane**. This name, he said, simply described the appearance and was not intended to imply the real pathological condition present. In the upper part of each cornea, was a flat white crescentic mass, looking like a membranous arch, above the pupil. The concave edge of this arch seemed upturned, and it looked as if one could readily peel the whole mass off from the cornea, but it was really beneath the epithelium, which, over it, was smooth, unbroken, and transparent. The condition had been present for two years and was apparently progressive.

Dr. CLAIBORNE reported a case of **extraordinary accommodation after cataract extraction**. Right eye, lens removed in capsule with small amount of vitreous lost; left eye, lens removed without capsule. Ultimate vision and refraction in right eye: $\frac{20}{40}$ with +12 s. +1.50 cyl. ax. 180°. Left eye: $\frac{20}{40}$ with +12 s. +1.50 cyl. ax. 180°. Vision with both eyes simultaneously was $\frac{20}{15}$. With this same combination of lenses, patient could read ordinary newspaper type, with the right eye at 18 inches or at 2½ inches. With the left eye patient could read the same type at 13 inches or at 8 inches. Could thread needle easily. In using both eyes simultaneously could read easily by looking straight ahead, with the eyes wide open. Patient would, when using each eye separately, incline the head to the right for the right eye and to the left for the left eye. Dr. Claiborne said that he did not think that satisfactory explanation had ever been given for this phenomenon. Accommodation was better in the eye from which the capsule had been removed. He advised others to examine for this condition.

Dr. THOMSON said that he had examined this case and substantiated the statements of Dr. Claiborne.

Dr. EMERSON said that he had seen a similar case in a small boy after needling a soft cataract.

Dr. SCHIRMER said that cases like the one presented by Dr. Claiborne have always engaged the attention of oculists and much discussion has arisen as to how to explain the same. Dr. Schirmer does not think it possible for aphakic eyes to accommodate. He thinks that these patients read in dispersion-circles. "Hess denies the existence of accommodation in aphakic eyes. He claims that the near point cannot be ascertained with sufficient accuracy by the reading test." For his own researches he has used the Scheiner test:

"When we put before the eye a dark shade with two small holes, both before the pupillary area, we get two cylinders of light in the vitreous which do not unite in the retina except when the eye is perfectly accommodated for the light point. If the accommodation is not perfect we see the light point doubled, or an ellipse instead of a circle."

Dr. B. W. KEY reported the results of **Lagrange operation upon a case of buphthalmos.** The case was that of an Italian

boy seven years of age, with an indefinite family history. Both eyes were noted to be unusually large from babyhood, the left more so than the right. At the time of the first examination, June 11, 1911, the right corneal diameter was 13*mm* and the left, 17*mm*. Vision in the right eye was $\frac{20}{40}$ which could not be improved with glasses; the left eye showed light perception only. The appearance of the right fundus was practically normal, aside from a beginning excavation of the nerve head with slight pallor on its temporal side. The changes in the left eye were those characteristic of an advanced buphthalmos. Outlines of the fundus could only be faintly seen; the nerve head was markedly cupped and the nerve atrophic. Tension was above normal in both eyes but more marked in the left. On June 12, 1911, the left eye was operated on, and on June 20th, one week later, the right. Tension has remained normal in both eyes up to the present time. With the exception of the contraction of the lower field, and an enlargement of the blind spot in the right eye, it has remained normal. Vision with correction is now $\frac{20}{15}$.

Vision in the left eye is still only light perception, but there has been no progress in the stretching of the coats of the eye.

DISCUSSION: Dr. WEEKS congratulated Dr. Key on the excellent results obtained in this case. He said that he had abandoned the Lagrange operation in these cases in favor of a small (1½*mm*) trephine, for the reason that it is not easy to regulate the size of the opening in the Lagrange operation, and a large opening in the sclera is apt to be dangerous. He has had several successful recoveries.

Dr. Key said that in this case he did succeed in making a small opening in the sclera, and that he removed a large piece of the iris to avoid the danger of prolapse.

MONDAY EVENING, MARCH 20, 1916.

Dr. JOHN R. SHANNON presented a case of **Mooren's ulcer of the cornea.** The trouble began in September, 1915. Dr. Shannon first saw the patient in January, 1916. The right eye then presented a typical picture of a rodent ulcer, involving about one fourth the circumference of the cornea, extending 4*mm* onto its surface at its widest diameter. The progressing

edge extended in a well defined curved line, with its convexity toward the center of the cornea. In spite of all treatment the ulcer has steadily progressed, so that at the present time it covers about one half the surface of the cornea. The ulcer has been cauterized successively with carbolic acid, formalin, and the actual cautery, with no arrest of its progress. The patient is now having instilled into her eye a one per cent. solution of ethylhydrocuprein, the pathologist having discovered the presence of pneumococci from the scrapings of the ulcer.

Dr. J. M. WHEELER presented **a patient in whose right eye a foreign body had been retained for fifteen years without causing any inflammatory disturbance.** The nature of the foreign body was uncertain. The man was hammering on a cobblestone at the time. The eye showed no evidence of siderosis. Only the exudate around the foreign body could be seen with the ophthalmoscope. Vision is now $\frac{20}{40}$ with correction. Removal of foreign body not advised. X-ray revealed its presence a little to the temporal side of and above the nerve head.

DISCUSSION: Dr. DIXON thought on account of the shape and location of the foreign body, the chances were in favor of its being steel. He had never seen stone penetrate so deeply into the eye. He had seen a case in which a piece of steel had remained in the eye for forty-one years without producing siderosis.

Dr. SCHIRMER said that unless iron is encapsulated it always produces siderosis.

Dr. J. GUTTMAN presented a case of **congenital coloboma of choroid and iris** in a child with defective mentality. The child's parents are second cousins.

Dr. MARTIN COHEN presented two cases of **retinitis punctata albescens,** colored sister and brother, aged, respectively, 6 and 13 years. Their family history is negative. Four other children in the family are unaffected. Aside from the eye symptoms and characteristic appearance of the fundi, both objective and subjective examination is negative. Their chief complaint was hemeralopia. The boy's vision is $\frac{20}{40}$ and the girl's $\frac{20}{70}$. No scotomata present. Visual field and acuity greatly reduced by diminished illumination.

The fundus changes are characteristic: Numerous discrete grayish white dots, with ill defined borders, varying in size from that of the diameter of a small retinal vessel to that of the disk. They are arranged concentrically around the equator, thence spreading toward the periphery. The perimacular and peripapillary regions are free from these dots. The retinal blood-vessels pass over the dots without causing any apparent paralactic displacement. Pigmentary changes absent.

Dr. SCHIRMER showed a case on whom he had **performed an extensive plastic operation for the relief of lupus, involving the lids and surrounding skin, conjunctiva, anterior parts of the orbit, and ethmoid bone.**

After eleven years of conservative treatment without relief, the patient (a colleague) readily consented to the radical removal of all of the tissues and organs involved. This included the eyeball, lids and conjunctiva, eyebrow, a part of the cheek, the soft tissues of the orbit, and the ethmoid bone. The cavity was filled with a ball of fat and covered with a pediculated flap from the forehead, together with the undermined skin from the adjacent margins of the wound. Thiersch grafts were used to cover the surface made bare by the pedicle flap from the forehead.

Recovery complete with no relapse after two and one half years.

Dr. JOSEPH BRUDER showed three specimens of **sarcoma of the choroid in young subjects.**

Dr. Bruder showed a case of **tuberculous uveitis** in a woman, age 26 years, with a history of disturbed vision for nine months. There were deposits on Descemet's membrane and an exudate in the vitreous, through which a mass in the choroid could be indistinctly seen. Six weeks ago tubercles appeared in the iris. Tension varies between 40 and 60*mm* of Hg. Following a subcutaneous tuberculin test, the patient was put on increasing doses of tuberculin. The tubercles in the iris are disappearing. Evidence of tuberculosis elsewhere in the body could not be found.

Dr. R. G. REESE showed a case of **chronic glaucoma in a child five years old.** The symptoms and physical signs were the same as found in an ordinary chronic glaucoma in an adult. Tension in each eye varied between 40 and 50*mm* of

Hg. Vision in the right eye reduced to light perception, and in the left $\frac{5}{200}$ excentrically. Two weeks after seeing the child Dr. Reese performed an iridectomy on each eye. It is now three years since the operations. The right eye has not improved, the left has, vision now being $\frac{8}{40}$. Patient can make out some of the letters in Jaeger No. 6 at five inches. Tension in both eyes has remained normal since the operation.

Dr. REESE showed a case of **sympathetic iridocyclitis** on which he had operated and in which he had succeeded in restoring vision from light perception to $\frac{20}{100}$.

Dr. Reese first performed an iridectomy and three weeks later, with an Agnew keratome, he entered the limbus, pushing the knife through the dense capsule and shrunken lens. With de Wecker scissors he cut through this mass down to and including the lower pupillary margin. Fluid vitreous escaped and the eyeball collapsed. The eye was filled with one half strength of normal salt solution. Patient is now self-supporting.

Dr. Reese, also showed a case of **gumma of the orbit** which had produced vascular changes resulting in what he thought was an arteriovenous aneurism between the internal carotid artery and the cavernous sinus.

Patient Miss M. Was first seen in September, 1915. Her predominating symptoms were severe headaches and exophthalmos, more pronounced on the right side. For three months she has had a buzzing noise in her right ear.

Physical examination at that time revealed a right-sided choked disk, excentric exophthalmos, concentric contraction of the visual field, and $\frac{20}{200}$ vision. The left fundus showed only tortuous veins, vision and field being normal.

The conjunctiva of the right eye was chemotic. Pressure would reduce the exophthalmos but not without pain. No bruit could be heard. Patient was admitted to the hospital and an examination of the blood revealed a positive Wassermann. She was given sixteen injections of neo-salvarsan and as many of salicylate of mercury at proper intervals. This was followed by inunctions of mercury and potassium iodide internally, to the point of toleration. The exophthalmos has receded about *3mm.* A systolic bruit can now be heard which is distributed by the bones of the skull. There

are tortuous, painless, compressible, venous swellings in the upper portion of the orbit, over which pulsation can be detected. Pressure on the right carotid produces no effect on the exophthalmos or bruit; pressure over the left carotid causes a disturbance of the bruit.

Distension of the transverse and circular sinuses is probably responsible for the venous engorgement on the left side.

Dr. DIXON showed X-ray plates of the case, which he interpreted as being suggestive of the condition described.

Dr. KNAPP said that he had presented a similar case with bilateral abducens paralysis. Recovery took place.

Dr. CUTLER said that he had seen this case several months ago; at that time the condition was confined to the right side. There were no signs of aneurism present. He thinks the exophthalmos about the same now as it was then.

Dr. REESE showed a case in which he had **restored both upper and lower lids by means of Wolfe grafts** in a man who had had a severe electric burn several years previously, resulting in extreme deformity.

Dr. G. W. JEAN showed a case of **neuroparalytic keratitis.** The patient gave a history of having had an attack of right hemiplegia six weeks previously. Patient now has paralysis of the fifth nerve and of the vocal cords. Dr. Jean thinks the condition due to aneurism of the basilar artery.

Dr. BRUDER showed a case of **ribbon keratitis** in an eye that showed no evidence of preëxisting inflammatory changes.

Dr. M. J. LEVITT showed a case of **aniridia** in a child two years of age.

Dr. GEORGE S. DIXON presented a **macrosopic specimen of an eye that had been removed for an equatorial rupture of the sclera.** The rupture was situated *2mm* behind the insertion of the external rectus muscle of the left eye. The case is of interest on account of the unusual occurrence of ruptures in this location.

Dr. Dixon reported the pathological findings in the case of globe removed by Dr. Reese for sympathetic irritation ten years after Mules's operation, in which there was a bone formation in a small piece of choroid that had been retained. The patient gave a history of periodic attacks of pain and inflammation in the stump ever since the ball was inserted.

For the past four years he has had marked photophobia and lacrimation (more pronounced when the stump was tender) in the sympathizing eye.

In addition to the bony formation, there was a thin straw-colored fluid which escaped when the sclera was opened. Dr. Dixon thought that this could be explained only on the ground that a portion of the ciliary body was retained.

Dr. Dixon thinks the case one which emphasizes the necessity of removing every part of the uveal tract if the Mules's operation is to be successful.

DISCUSSION: Dr. WILSON said that he had performed the operation fifteen years ago with no ill effects.

Dr. REESE said that he had operated on a case fifteen years ago and recently had to remove the shattered fragments of glass which were almost as thin as tissue paper. He thinks the glass was corroded by the tissues.

Dr. GEORGE H. BELL said that several similar cases have been reported, which may have been due to faulty technic or incomplete removal of the uvea, which proves that the operation is not devoid of danger. He thinks it a dangerous procedure and always advises against it.

Dr. DIXON also showed **skiagrams of the sella in a case of hypophyseal tumor under observation three years.**

Dr. LESZYNSKY showed a case of **hypo-pituitarism.** The patient showed the cardinal symptoms of this disease and it was impossible to tell whether the condition was due to disease or to pressure due to a distended third ventricle.

Dr. KNAPP asked what was the cause for the serous meningitis. He cited a case operated on by Dr. Hirsch in Vienna, for a presumptive pituitary tumor, which proved to be a distended third ventricle, and the patient died following the opening of this cavity.

Dr. BERNARD SAMUELS showed a case of **neuroretinitis from sphenoidal sinusitis.** The patient gave a history of having had influenza a few weeks previously, otherwise there was nothing to account for the condition. Physical examination and X-ray were of doubtful value. The case was referred to Dr. S. L. Craig who opened and drained the ethmoids and sphenoid sinuses on both sides. The patient made a rapid recovery with restoration of normal vision in both eyes.

The field in the right eye remains contracted. At no time was there a central scotoma.

Dr. SAMUELS also showed a case that had been operated on by Dr. Reese in May, 1915, for the **relief of increased tension in an eye with a detached retina.** Dr. Reese removed a button of sclera, with a *2mm* trephine, over the site of the detachment. He did not aspirate the subretinal fluid. The retina has remained detached, but the tension has been permanently lowered to *11mm* of mercury. The same tension exists in the fellow (sound) eye.

Dr. C. E. MCDANNALD showed two cases (twins), one of which had all of the characteristics of hereditary lues, including interstitial keratitis and a positive Wassermann; the other reacted negatively to the Wassermann test and showed no signs whatsoever of the disease.

Dr. WEBB W. WEEKS showed a case of **staphyloma of the cornea relieved by trephining the sclera,** and a case of **streptococcus keratoconjunctivitis treated with diphtheritic antitoxin.**

Dr. H. H. TYSON reported a case of **transient bilateral ophthalmoplegia interna associated with snow blindness.** The case was that of a boy 11 years of age who had been sleighing continuously for eight hours in the bright sunlight. The condition lasted for two days.

Dr. Tyson referred to a case reported by Katz in 1902 where transient paresis of the sphincter pupillæ occurred following an observation of an eclipse of the sun, and prolonged ciliary spasm was thought responsible for the paresis. Dr. Tyson thinks the etiology in his case the same.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OPHTHALMOLOGY OF THE ROYAL SOCIETY OF MEDICINE.

By C. DEVEREUX MARSHALL, F.R.C.S., London.

At a meeting of the Section held on March 22d, Sir Anderson Critchett, Bart., C.V.O., in the chair, Colonel Lister, A.M.S., C.M.G., and Lieut-Col. Gordon Holmes, M.D., R.A.M.C., read a paper entitled **Disturbances of vision from cerebral lesions, with special reference to the cortical representation of the macula.** The authors stated that, in their work at the base hospitals in France during the past eighteen months, they had observed a very large number of cases in which the vision was affected by lesions of various portions of the optic system, but the time and opportunity afforded had not been sufficient for the careful and complete examination of all. Hence in some cases of considerable importance only scanty and incomplete notes had been secured. Still, by selecting for thorough examination a certain number of suitable cases, a group of facts had been collected which had an important bearing on the cerebral localization of vision, more particularly on the representation of different regions of the retina in the cortex. It may be objected, say the authors, that as the observations were, necessarily, made at an early stage after the infliction of the injury, some of the effects observed may have been due to functional disturbances, rather than to local injuries, of the corresponding areas of their centripetal fibers. But if it could be shown that there was a constant relation between the probable site of the injury and the form of the visual defect, certain conclusions would at least be justifiable.

The injuries in the cases referred to included penetrating

and perforating wounds of the cranium by rifle bullets, shell fragments and shrapnel, as well as local concussion and depressed fractures. They remarked on the striking rarity of superior quadrantic hemianopia in gunshot wounds of the occipital region.

The authors point out that in over 2000 cases of head injury they never saw a central scotoma when a direct injury of the occipital poles could be excluded, and they regard this as striking evidence that central vision is represented on either, or both, the mesial or the lateral surface of the posterior borders of the occipital lobes. And the observations conformed to the general view that the visual area corresponds with, or at least includes, the area striata.

The interesting question is discussed as to whether vision for colors may be dissociated from that for white; in other words, whether an achromatopsia can be produced by cerebral lesions. The authors consider that they have gleaned no conclusive evidence that achromatopsia, with intact vision for white, is produced by cerebral lesions which involve either the cortex or the optic radiations.

The authors' conclusions, which they do not yet regard as final, are formulated as follows:

(1) The upper half of each retina is represented in the dorsal, and the lower in the ventral, part of each visual area.

(2) The center for macular or central vision lies in the posterior extremities of the visual areas, probably on the margins and the lateral surfaces of the occipital lobes.

(3) That portion of each upper quadrant of the retina in the immediate neighborhood of, and including, the adjacent part of the fovea centralis, is represented in the upper and posterior part of the visual area in the opposite hemisphere, and *vice versa*.

(4) The center for vision from the periphery of the retinæ is probably situated in the anterior end of the visual area, and the serial concentric zones of the retina from the macula to the periphery are probably represented in this order from behind forwards in the visual area.

The contribution concludes with a grateful acknowledgment of the assistance received from the medical officers of the various hospitals in which the cases were observed, and of

the help of Captain Curtis Webb in the preparation of the illustrations.

The CHAIRMAN, in expressing the gratitude of the Section to the authors for their painstaking research, referred to the rapid strides made by brain surgery, and the unexampled opportunities afforded by the present conflict to make advances in surgical and medical knowledge.

Lieut-Col. ELLIOTT asked whether Colonels Lister and Holmes were able to confirm the estimate as to the efficacy of the steel helmet in preventing head injuries. He also referred to the greater severity of wounds inflicted by bullets which struck in the first 250 yards of their flight, before they had settled down to their steady onward course, as compared with those which found their billet at distances between 250 and 1000 yards.

Captain ORMOND suggested a possible confirmation of the authors' thesis in the central scotoma met with in some people who were subject to megrimous attacks. It was probably a vascular phenomenon, dependent on the macular center being placed at the posterior pole of the occipital lobe.

Mr. LESLIE PATON urged ophthalmologists in this country who received cases from France after the shock and the acute symptoms had subsided, to exercise great care in the taking of the fields of vision and the construction of perimeter charts (though not with the McHardy perimeter), and follow the cases up, as far as possible, keeping a record of their sequelæ, and in that way assist in making the investigations of the authors of abiding value.

Mr. J. H. PARSONS supported Mr. Paton, and asked that when ophthalmic cases were sent over, the notes should accompany them.

Col. HOLMES briefly replied, remarking that as the steel helmets had only recently been issued to the British Army, it was as yet too soon for conclusions to be drawn.

QUARTERLY REVIEW OF THE PROGRESS OF OPHTHALMOLOGY.

By H. KOELLNER, Berlin; W. KRAUSS, Marburg; R. KÜMMELL, Erlangen, W. LOEHLEIN, Greifswald; H. MEYER, Brandenburg; W. NICOLAI, Berlin; H. PAGENSTECHER, Strassburg; K. WESSELY, Würzburg; and M. WOLFRUM, Leipsic, with the Assistance of Drs. ALLING, New Haven; CALDERARO, Rome; CAUSÉ, Mayence; DANIS, Brussels; GILBERT, Munich; GROENHOLM, Helsingfors; v. POPPEN, Petrograd; TREUTLER, Dresden; and VISSER, Amsterdam.

Edited by MATTHIAS LANCKTON FOSTER, M.D., F.A.C.S., New Rochelle, N. Y.

THIRD QUARTER, 1915—*Continued.*

VIII.—ACCOMMODATION AND REFRACTION.

29. KRUSIUS. **The importance in school hygiene of the early recognition of anomalies of the refraction, together with a description of an optometer suited to this purpose.** *Archiv f. Ophthalmologie*, xc., p. 329.

KRUSIUS (29, **Importance of the early recognition of anomalies of the refraction**) gives statistics obtained from the higher schools of Prussia. He declares that not one half of the ametropes who should be wearing glasses have been corrected, and urges that the ametropes should be sought out every year and sent to specialists for correction.

IX.—THE MOTOR APPARATUS OF THE EYES.

30. BIELSCHOWSKY. **Contribution to the study of recurrent and alternating ophthalmoplegia externa.** *Arch. f. Ophthalmologie*, xc., p. 433.

31. WESTPHAL. **Eye symptoms in a case of traumatic hysteria.** *Niederrhei Gesellsch. f. Natur- und Heilkunde*, Bonn, June 14, 1915.

According to BIELSCHOWSKY (30, **Recurrent and alternating ophthalmoplegia externa**), this peculiar picture began in a man

19 years old, and recurred at irregular intervals during five years of observation. Paresis of certain ones of the different nerves that supply the extrinsic muscles of both eyes; paresis of all of the extrinsic muscles of both eyes with ptosis; unlimited mobility of the eyes in stereoscopic vision, merely with latent disturbances of the balance. The inner muscles of the eyes escaped entirely and no other symptoms were demonstrable.

WESTPHAL (31, **Eye symptoms in traumatic hysteria**) saw a bilateral ophthalmoplegia externa in a soldier after a slight revolver-shot wound, associated with blepharospasm. On irradiation and on attempts to move the eyes the latter sometimes assumed a position of extreme convergence with myosis. The patient also had color blindness, a great contraction of the visual field, and areflexia of the cornea. He considered the case to be one of hysteria.

X.—LIDS.

32. ELSCHNIG, A. **Tarsorrhaphy.** *Zeitschr. f. Augenheilk.*, May-June, p. 280.

33. FAGIN, ROBERT. **A resumé of the six cases of blastomycetic infection of the eyelids reported in Memphis.** *Ophthalmoscope*, September, 1915, p. 426.

34. JACKSON, EDWARD. **Blastomycosis of the eyelids with report of cases.** *Journal A. M. A.*, July 3, 1915.

35. KEMPSTER, CHRISTOPHER. **Treatment of trichiasis by means of X-rays.** *British Medical Journal*, February 20, 1915.

ELSCHNIG (32, **Tarsorrhaphy**) presents a new method. First an intermarginal incision is made in the temporal part of the lower lid for a distance determined by the amount of shortening required, at the medial end of which the conjunctival layer is cut vertically to the margin of the lid. Then the two layers of the lid are separated as far as the external canthus and freshened, the outer one with protection of the lashes. The same is then done to the upper lid, but the inner layer is cut out in the form of a triangle with its apex toward the external canthus, and the inner layer of the lower lid is drawn into this defect by means of a double armed suture. The two outer layers of the lids are now united by two or three sutures, and finally the suture that fixes the inner layer of the lid, which comes out some 4*mm* above the lashes of the upper

lid, is tied. In this way the lashes of both lids remain perfectly intact and give a more natural appearance.

KEMPSTER (35, **Treatment of trichiasis by means of X-rays**) urges the use of X-rays for the cure of ingrowing eyelashes. He reports a case in which two applications were made and there has been no recurrence after four and a half months.

CURRAN.

JACKSON (34, **Blastomycosis of the eyelids**) reports two cases. The first was a man, aged 68, presenting extensive superficial cicatrices over almost the whole left side of the head. The left eyelids were enormously everted and the cornea opaque. There were a number of active lesions sharply outlined with elevated edges and the examination of the pus showed the budding organism characteristic of blastomycosis. A course of treatment with potassium iodide healed the lesions, but the patient died before operative measures could be undertaken. The second case, a woman of 39, noticed a small swelling on the upper lid, and although many operations were performed to eradicate the disease it extended progressively. Both lids were thickened and there were three ulcerations covered with granulations. Treatment with iodide effected a cure.

ALLING.

FAGIN (33, **A resumé of the six cases of blastomycetic infection of the eyelids reported in Memphis**) in reviewing these cases says that about twenty-five per cent. of skin lesions from this infection are found in the regions of the eyelids, but the conjunctiva remains unaffected except from exposure, a fact which helps to differentiate it from cancer, which it may resemble in some manner. The article is illustrated by seven good pictures.

CURRAN.

XI.—LACRIMAL ORGANS.

36. BIRCH-HIRSCHFELD, A. **Mixed tumors of the lacrimal gland.** *Archiv f. Ophthalmologie*, XC., p. 110.

37. ELSCHNIG, A. **Repair of the canaliculus.** *Klinische Monatsblaetter f. Augenheilkunde*, July-August, 1915, p. 144.

The tumors of the lacrimal gland, like those of the salivary, very often are mixed, with a very complicated structure, according to BIRCH-HIRSCHFELD (36, **Mixed tumors of the**

lacrimal gland). They contain epithelium-like cells arranged in various ways, part of which are morphologically like true epithelium. Basal membranes, intercellular spaces, and cornification may be demonstrated. The varying relations to the surrounding stroma give in many places the picture of an endothelioma, in others that of a typical cylindroma, adenomyxoma, or chondromyxoma. The epithelial nature of the parenchymatous cells seems to the writer more probable than the endothelial origin. At first these mixed tumors grow very slowly, but may suddenly become malignant. Early and complete removal is indicated.

To restore a divided canaliculus, ELSCHNIG (37, **Repair of the canaliculus**) introduces a very fine probe into the punctum and through the peripheral portion of the canaliculus. The nasal portion of the lid is then so stretched with forceps that the nasal portion of the canaliculus is laid bare. A silk thread is then passed close to the posterior wall of the canaliculus to a corresponding place on the posterior wall of the other portion, and a similar suture through the skin is made to unite the anterior wall of the two cut ends. The probe is then passed through the nasal part of the canaliculus to the lacrimal sac and the sutures are tied. These remain in place for five or six days and the probe is removed a day later. He has done this operation with good results in three cases, but it failed in two cases in which the wound was much crushed.

XII.—ORBITS, EXOPHTHALMOS, ACCESSORY SINUSES.

38. BIRCH-HIRSCHFELD, A. **A noteworthy case of carcinoma of the orbit.** *Archiv f. Ophthalmologie*, xc., p. 299.

39. HEGNER. **Intermittent exophthalmos.** *Deutsche med Wochènsch.*, p. 1084.

40. WOKENIUS, H. **Concerning acute osteomyelitis of the frontal bone due to combined empyema of the anterior accessory sinuses of the nose.** *Zeitschrift f. Augenheilkunde*, 1915, p. 283.

BIRCH-HIRSCHFELD (38, **Carcinoma of the orbit**) describes a remarkable case. The first symptoms noted in a woman of thirty-five were diplopia, lacrimation, and a slight tenderness on pressure upon the globe. Then came swelling of the lids, a slight chemosis, exophthalmos, limitation of movement inward and upward, crossed diplopia, and a slight rise of temperature.

As the exophthalmos, chemosis, and pain increased rapidly the tissues of the orbit were incised, revealing a diffuse infiltration, but no definable tumor. When the exophthalmos reached 11*mm* the orbit was exenterated; the contents of the orbit were tensely infiltrated, and microscopic examination revealed a carcinoma. Soon afterwards infiltration appeared in the right temple, later a choked disk in the left eye, but no cranial symptoms were shown up to death. Autopsy revealed an extensive tumor in the right temporal lobe, along the base of the brain to the hypophysis, which had densely infiltrated the Gasserian ganglion, broken through the temporal bone, and involved the temporal and masseter muscles. It was a carcinoma that had started probably from a duct of the hypophysis. In the orbit instead of a large compact tumor, almost every section showed little tumor nodules that were all surrounded by connective-tissue capsules; nowhere was there a diffuse infiltration with tumor cells. Many of the nodes showed great inflammatory infiltration; their positions corresponded to the spread of the orbital veins. The writer thinks that the tumor at the base of the skull had proliferated secondarily into the veins of the orbit. In the eyeball itself several little nodes were found within a large choroidal vessel. At a corresponding place behind the sclera lay an extensive hemorrhage in which heaps of tumor cells likewise were found. The vessels of the retina were very full, the papilla swollen. Close to the exit of the central vein was a tumor nodule in the optic nerve. As nothing was known of the intracranial tumor before the autopsy the author thinks that it may have started from an excretory duct of the lacrimal gland.

HEGNER (39, **Intermittent exophthalmos**) reports the case of a man 26 years old whose left eye had for the past six months protruded greatly whenever he stooped or strained himself bodily. The protrusion was followed by tension in the orbit, a feeling of terror, and dizziness; the vision fell temporarily from $\frac{5}{5}$ to $\frac{5}{25}$. The cause was thought to be a congenital hæmangioma of the orbit which had become progressive recently.

In WOKENIUS'S (40, **Acute osteomyelitis of the frontal bone caused by sinusitis**) case an inflammation had existed for a long time in the antrum of Highmore, the frontal sinus, and

the ethmoid, all on the left side. Probably in consequence of an infection with very virulent streptococci, the diploë of the frontal bone became affected in the form of a fulminating osteomyelitis which involved the meninges and caused death in four days. The left frontal sinus was opened, found small and shallow, contained no pus, and the posterior recess in the orbital roof could not be seen. On the anterior surface of the frontal bone, to the temporal side of the sinus, there was a minute opening through which a thin, grayish-yellow pus exuded. The only involvement of the eye was a great fullness of the retinal veins. The swelling of the upper lid naturally followed from a like change in the brow, but perhaps it was caused partly by the subperiosteal abscess at the margin of the orbit.

XIII.—CONJUNCTIVA.

41. BLACK, N. M. **Face-powder conjunctivitis.** *Annals of Ophthalmology*, July, 1915.

42. FREYTAG, G. TH. **Papilloma of the conjunctiva.** *Arch. f. Ophthalm.*, xc., p. 367.

43. GIRI, D. V. **Parinaud's conjunctivitis in a case of mumps associated with neuroretinitis and albuminuria.** *Ophthalmoscope*, September 1, 1915.

44. LOEWENSTEIN, E., and HERRMAN. **Studies of a specific treatment for trachoma.** *Deutsche med. Wochenschrift*, 1915, p. 1062.

45. LUNDSGAARD, K. **The so-called primary conjunctival tuberculosis and the conjunctival tuberculosis in lupus patients.** *Klinische Monatsbl. f. Augenheilkunde*, July-August, 1915, p. 97.

46. SHOEMAKER, W. E. **Hypertrophy of the conjunctiva.** *Ophthalmic Record*, July, 1915.

LUNDSGAARD (45, **Conjunctival tuberculosis**) reports forty-eight cases of conjunctival tuberculosis, nineteen of them without and twenty-nine with lupus. The former, the so-called primary form, occurred exclusively in young people, more often in females, was always unilateral, on the left side more than on the right, most commonly on the upper lid, and was always accompanied by a swelling of the lymphatic glands, which commonly suppurated. In the patients with lupus the disease appeared at a rather older age, was frequently bilateral, the right and the left eye was the seat about equally often, and males were as apt to be attacked as females. Swelling of the

lymphatic glands was rare and slight. From these facts and the clinical symptoms the author concludes that primary tuberculosis is of endogenous origin, while that with lupus is ectogenous. Lundsgaard speaks highly of the Finsen treatment, especially in the primary cases, all of which recovered without impairment of the function of the eyes.

BLACK (41, **Face-powder conjunctivitis**) has seen a number of cases of conjunctival hyperæmia associated with blurring, itching, and mucilaginous discharge in which small pentagonal crystals but no organisms were found under the microscope. The condition is caused by the use of face powder containing comminuted rice grains.

ALLING.

LOEWENSTEIN and HERRMAN (44, **Specific treatment of trachoma**) obtained an antigen by expressing trachoma granules, triturating them in physiological salt solution in a porcelain mortar, and then made a subcutaneous injection. This produced no reaction and no signs of allergia; the first favorable influence appeared some eight or ten days after the injection. The infiltration of the conjunctiva decreased, and in pannus there was a slower atrophy of the gelatinous deposits and a clearing up of the cornea. The result in the three cases that had been treated was good, in one the vision had been improved remarkably, from perception of light to counting fingers at four meters.

FREYTAG'S (42, **Papilloma of the conjunctiva**) case was one of benign papilloma which recurred several times. The patient was 4 years old. The palpebral conjunctiva was studded with numerous little, reddish, rough, wartlike efflorescences which appeared hyaline in places and looked like pointed condylomata. Some small ones were situated in the nasal part of the bulbar conjunctiva, the conjunctiva of the upper lid, the region of the caruncle, and the plica semilunaris. They bled easily. New proliferations appeared soon after their removal. The microscopical appearance was that of papilloma.

GIRI'S (43, **Parinaud's conjunctivitis in a case of mumps associated with neuroretinitis and albuminuria**) patient complained of diminution of vision a few days after the onset of the mumps. The ophthalmoscopic examination was made about two weeks later, when fever and parotid swelling had

subsided, and he was found to be suffering with neuroretinitis in both eyes. The disks were not very much swollen, but they were choked with exudates. There were some hemorrhages and exudates in the retina. The arteries were small and the veins tortuous and dilated. The urine showed a heavy cloud of albumin. Ten weeks later he developed a condition resembling Parinaud's disease. Giri associates this infection with the mumps. He thinks the virus of the mumps was still active in a subacute form.

CURRAN.

SHOEMAKER (46, **Hypertrophy of the conjunctiva**) describes a patient with enormous overgrowth of the lymphoid elements of the conjunctiva of both lids of one eye. There were tumor-like elevations crowded together, more or less polygonal in form. There were no inflammatory signs or irritation. The laboratory report designated the tissue as simple hyperplasia. It had remained unchanged for nearly four years. It seems likely that the condition was hyaline or amyloid degeneration in the early stage.

ALLING.

XIV.—CORNEA AND SCLERA.

47. CORDS. **The value of the conjunctival covering in war.** *Muenchener med. Wochenschrift*, p. 1196.

48. FUCHS, E. **Keratitis pustuliformis profunda.** *Archiv f. Ophthalmol.*, xc., p. 13.

49. HASELBERG. **Treatment of corneal ulcers with lactic acid.** *Wochenschrift f. Ther. u. Hyg. des Auges*, 1915, No. 25.

50. HASELBERG. **Eyelash embedded in the cornea.** *Ibid.*, No. 23.

51. SEEFELDER, R. **Further contributions to the study of degenerative changes of the cornea.** *Arch. f. Ophthalm.*, xc., p. 394.

FUCHS (48, **Keratitis pustuliformis profunda**) describes a rare form of keratitis in which the chief symptom consists of pus-yellow points, like little pustules, in the most posterior layers of the cornea, while the anterior layers remain uninvolved. A severe iritis with hypopyon is always present. He gives the clinical histories of sixteen cases, in four of which anatomical investigations were made. The inflammation affects only the posterior layers of the cornea and decreases in intensity from behind forwards. The affection is most marked in the region of the pupil. No pus bacteria could be found in

the exudate in the anterior chamber. The iris was infiltrated with lymphocytes and plasma cells. The inflammation was confined to the cornea and iris; the deeper structures showed only secondary changes. A special condition found in two cases was an abolition of the anterior chamber without perforation and the consequent agglutination of the iris to the posterior surface of the cornea. The anatomical picture gives the impression that the inflammation started from the iris. Concerning the course of the disease the author presents the following hypotheses. As this is a disease of the deepest layers of the cornea and one which commonly occurs in the pupillary area, and there is no indication of any ectogenous infection as the cause of the disease, it can come only from the margin of the cornea, or from the chamber to the most posterior layers of the cornea. In favor of the latter is the fact that the changes in the cornea decrease in intensity from the posterior surface forwards. Everything was not distinct in many of the cases, and it is necessary to see the cases early in order to be sure that the start is with an iritis. But it is not the hypopyon that attacks the cornea, the first yellow spots are never in the lowest part of the cornea, but one must suppose that such substances as bacteria or toxines are suspended or dissolved in the aqueous. As bacteria were not found, these substances must be toxines. Why they attack the cornea only in places is not clear. The toxic substances in the aqueous can come only from the iris. Iritis therefore is a precondition to keratitis pustuliformis profunda, and this must be of certain varieties. Certain indications of tuberculosis or syphilis were not found, so the ætiology is dark, and it is possibly not always the same. This form of keratitis is rare. The disease starts as an iritis from unknown cause and spreads to the cornea through the excretion of toxic substances into the aqueous. The observed cases have been met with chiefly in men of advanced age. The course is slow and tedious and leads to a great impairment of the vision, sometimes to blindness.

Von Haselberg (49, **Treatment of corneal ulcers with lactic acid**) recommends the application of lactic acid, either pure or in a fifty per cent. dilution, to serpiginous ulcers. A slender probe is dipped in the acid, then shaken until only a

trace of the fluid can be seen on its end, applied for five or ten seconds to the base of the ulcer and the undermined portions of its margin, and then washed off with salt solution. Previous cocainization of the eye is necessary. Almost always the ulcer comes to a standstill, so that a second application is needed in only a few cases. The scar is very delicate and superficial.

SEEFELDER (51, **Degenerative changes of the cornea**) describes five cases in which degenerative changes developed in the center of the cornea either alone or in association with an arcus senilis. As yet it has been observed only in old people. A gray-white opacity appears in the center of the cornea, which is composed of little points and extends through nearly the entire thickness, though the surface remains smooth and lustrous. The first case was one of a workman 61 years old in whom the central opacity had developed within three or four years with no symptoms of inflammation. There was no opacity anywhere else in the cornea, not even an arcus senilis. The second case, a woman 63 years old, had in addition to the central opacity in both eyes a broad total arcus senilis with a zone of perfectly clear corneal tissue between. In the third, an artisan 60 years old, the central opacity and the arcus senilis in the right eye were joined by two broad bridges, in the left by a narrow projection. Several striæ of clear corneal tissue could be seen in the central opacity. As such transparent lines occur only in old corneal scars as newly formed normal tissue, the author doubts whether the opacity should be considered degenerative without further evidence, in spite of the fact that inflammation was denied; otherwise these places were spared by the process of degeneration. The fourth case was like the third, except that there was no arcus senilis. The fifth case gave a quite different picture. A tailor 66 years old had been losing his sight gradually for seven years without any inflammation. In both of his eyes there was a corneal opacity consisting of minute points and clouds with a bluish tint. Where the opacity was most intense the cornea was thickened and the surface coarsely uneven, though elsewhere smooth and lustrous. Both eyes were without irritation.

CORDS (47, **Value of the conjunctival covering in war**) has seen this value in many cases on which he had to operate because of injury to the cornea. Most of his thirty-four cases

were or more or less gaping wounds, in which simple abscission of the prolapse of iris gave a particularly bad prognosis. He used the conjunctival covering even in desperate cases and had the opportunity to see that eyes which had lost the power to distinguish light from dark regain this power gradually. In all cataract operations he uses this covering as a prophylactic, as he has to operate in the same operating room in which badly infected wounds are treated, and has had recovery without reaction in all extractions of wounded lenses. In thirty-four eyes he saved useful vision in thirteen, and a trace of vision in nine. He ascribes to the conjunctival covering mainly the fact that he was able to save the sight in such a comparatively large number of these serious wounds, because it protects against both secondary infections and sympathetic inflammation and contributes materially to a more rapid and more solid cicatrization.

Von Haselberg (50, **Eyelash embedded in the cornea**) describes a case in which three days after a contusion wound with a piece of iron an eyelash was found healed into the cornea, with the surface of the cornea smooth and lustrous over it. The only stain obtained with fluorescin was in various little places vertically to the lash and at the depth with it beneath the surface. There was no injection about the cornea. The lash was removed with a foreign-body needle. Probably the piece of iron made a groovelike gash in the cornea and deposited in it the lash which it had torn out in passing, and that the corneal epithelium had proliferated over the lash. The author thinks it possible that such a lash might wander in the cornea, perforate Descemet's membrane, and finally enter the anterior chamber.

XV.—IRIS AND PUPIL.

52. Bergl. **Bilateral reflex pupillary immobility after trauma to the skull through distant action of a grenade.** *Deutsche med. Wochenschr.*, p. 1161.

53. Tooke, Frederick. **The inefficacy of iodoform in a case of tuberculous iritis.** *Ophthalmology*, July, 1915.

54. Wiener, M., and Wolfner, H. L. **A reaction of the pupil strongly suggestive of arteriosclerosis with increased blood pressure.** *Journal A. M. A.*, July 17, 1915.

BERGL (52, **Bilateral reflex immobility of the pupils after trauma to the skull**) reports a case of this nature caused by the gas pressure of a bursting grenade. The strong young man, 22 years old, who showed no signs of syphilis, had symptoms of commotio cerebri after the explosion. His pupils were immobile to light, but reacted to convergence. This condition lasted about three weeks and then gave place to a normal one. The seat of this immobility should be sought in the region of the central reflex arc, in the central gray of the aquæductus Sylvii.

Iodoform has been recommended from time to time in the treatment of tuberculosis both locally and for general infection. It has, however, never proved to be of value. TOOKE (53, **Inefficacy of iodoform in tuberculous iritis**) had the opportunity to examine an eye which was enucleated on account of tuberculous iritis. It had not been found practical to treat the case with tuberculin, but powdered iodoform had been introduced into the anterior chamber with very little reaction, and two injections of iodoform emulsion were given. The condition seemed to improve, but relapses soon followed. He is of the opinion that the apparent benefits arising from the use of this drug locally are due to drainage of the aqueous and entrance of air into the anterior chamber. The mechanical effect of the paracentesis is to create a localized hyperæmia. The pathological examination showed numerous areas of lymphocytic infiltration in the substantia propria, bands of adhesions between the iris and Descemet's membrane, tubercles on the anterior surface ot the iris, desquamated iris pigment, and cataractous changes in the anterior fibers of the lens. No tubercle bacilli were found by staining.

ALLING.

WIENER and WOLFNER (54, **Reaction of the pupil suggestive of arteriosclerosis**) say that under these conditions the pupil is found to be larger than the average in width, contracts promptly to light but immediately returns to the original size and there remains, without the light stimulus being removed. While not claiming that the phenomenon is pathognomonic of arteriosclerosis they maintain that it is nearly constant and very suggestive.

ALLING.

XVI.—LENS.

55. FISHER, W. A. **A new and safe technic for the cataract operation.** *Ophthalmology*, July, 1915.

56. HEGNER. **Clinical studies concerning the prognosis of intrabulbar luxation of the lens.** *Beiträge zur Augenheilkunde*, 90.

57. HEGNER. **Remarks concerning the behavior of the fibers of the zonule in ectopia luetis.** *Klin. Monatsbl. f. Augenheilkunde*, July-August, p. 2.

58. HEGNER. **Prognosis of luxations of the lens.** *Berliner klinische Wochenschrift*, p. 1054.

59. HEGNER. **The dependence of the growth of the lens on the zonule of Zinn.** *Klin. Monatsbl. f. Augenheilkunde*, July-August, p. 30.

HEGNER (56, 57, 58, 59, **Dislocations of the lens**) presents in these papers a study of 1166 cases of luxation, of which 120 were caused by traumatism. Old people are affected with marked frequency, which is to be ascribed to a greater rigidity of their tissues, especially of their zonules, and to the diminution of these fibers in old eyes, so that a slight injury may displace the lens without affecting the eye in any other way. A much greater force is necessary to luxate the lens in young eyes and this usually produces other serious injuries. Simple displacement of the lens without other injury was found in only twelve per cent. of the young subjects. Increase of tension occurred in eighteen of twenty-two cases of subluxation, its onset varying from two or three days to years after the injury, often coming on slowly. Measures to reduce the tension, whether with myotics or with operations, usually failed. The lens was extracted in seven cases, but in only one did the operation result in useful vision. Opacities were present in the lens in ninety per cent. The fibers of the zonula were almost always wanting at the free margin of the lens, and often were torn. The vitreous did not protrude in spite of the spaces left by the absent fibers of the zonule. Spontaneous reposition took place in two cases, so we must suppose that in these the fibers were stretched but not torn. Complete luxations of the lens into the vitreous are seldom followed by increase of tension or inflammation, because there is no dragging on the fibers of the zonule. The vitreous later becomes fluid and contains opacities. Often fine punctate opacities may be observed, which are inflammatory exudates. The prognosis for vision is good as compared with that of subluxations.

Attempts to remove the opaque lens from the vitreous are not indicated on account of the difficulty of the operation and the great loss of vitreous. The displacement of the lens into the anterior chamber is a very serious condition, as it as good as always induces an increase of tension. The removal of the lens is the proper operation, but it is not easy to perform, and the outlook of the operation is not good, particularly because of the loss of vitreous, so it may often be better to displace the lens back into the vitreous. In one case the increased tension persisted after the lens had been removed. In another an expulsive hemorrhage occurred. There is not only a hernia of the vitreous into the anterior chamber, but also a mixing of the vitreous with the aqueous. In congenital and spontaneous displacements of the lens we should differentiate between congenital anomalies of position, congenital predisposition, and acquired predisposition. In the first the lens is not properly centered in the optic system, because of a faulty behavior of the fibers of the zonule. In six ectopias there was no break in the circle of fibers, but an irregular breadth of the band and a stronger development on one side. The ruptures that take place later are results produced by the dragging. From these are to be distinguished those in which the fibers are faulty or absent, of which there were four cases. These are due to faults of development. The prognosis as regards vision and increase of tension are good in true ectopia, but bad when there is a defect in the zonule, when the displacement continually becomes greater, so that the lenses for the most part become dislocated into the vitreous. The cases of acquired predisposition are those of high myopia, buphthalmos, and all diseases which injure the vitreous, the zonule, and the lens itself. A family tendency rarely can be demonstrated.

FISHER (55, **A new and safe technic for the cataract operation**) employs two new instruments in a modification of the Smith operation. One is a hook retractor for the lower lid, and the other a straight needle which he uses to pierce the lens if the vitreous presents before the lens can be delivered. He believes this to be a safer method of procedure than extraction with a spoon. He thinks that these changes in the operation for extraction in the capsule have robbed it of practically all its objections. ALLING.

XVII.—VITREOUS, CHOROID, AND SYMPATHETIC OPHTHALMIA.

60. CLEGG, J. GRAY. **A case of acute primary pneumococcal choroiditis.** *Ophthalmoscope*, June, 1915, p. 276.

61. WOOD, C. G. RUSS. **Choroidal sclerosis.** *Ibid.*, August, 1915, p. 374.

CLEGG (60, **A case of acute primary pneumococcal choroiditis**) presents a case of this condition which he has followed from its very early stage throughout its whole course when he finally eviscerated the eye, finding pneumococcus alone in the specimens. Eight days previous to the consultation the patient had noticed muscæ in his right eye which were more pronounced during the last two days. On examination the disk was slightly blurred and the retinal vessels were full. Two whitish areas were visible, one above and one below the fovea. The next day slight injection of the conjunctiva appeared. Two days later the iris was discolored and the anterior chamber deeper than normal. The cornea was hazy and, seen through the loupe, appeared to have fine lines. There was no keratitis punctata. The vitreous was hazy and the exudates were larger and the disk was just barely visible. A diagnosis was made of tubercule. The condition rapidly grew worse and three weeks afterwards there was a fully developed panophthalmitis. The contents of the eye were scooped out and pneumococci found. The other eye remained normal.

CURRAN.

WOOD (61, **Choroidal sclerosis**) reports a case of primary choroidal sclerosis in a woman, occurring at the time of the menopause. The majority of the cases which he has seen occurred in women in middle life, and he thinks that the primary choroidal sclerosis is not infrequently associated with the menopause.

CURRAN.

XVIII.—GLAUCOMA.

62. BUTLER, T. H. **The tragedy of sclerostomy: an account of eight examples of late infection.** *Ophthalmoscope*, August, 1915, p. 370.

63. GILBERT. **Contributions to the study of glaucoma. II. Pathological Anatomy. Early stages of cavernous atrophy of the tissues in hemorrhagic and simple glaucoma.** *Archiv f. Ophthalmologie*, xc., p. 76.

64. TODD, F. C. **An operation for glaucoma. Filtration secured by a leechbite incision.** *Annals of Ophthalmology*, July, 1915.

GILBERT (63, **Early stages of cavernous tissue atrophy in hemorrhagic and simple glaucoma**) found in two cases of hemorrhagic glaucoma that the optic nerve was saturated by a homogeneous tissue fluid both in front of and behind the lamina cribrosa. In one case this saturation was very distinctly marked in front of the lamina in the vicinity of one of the central vessels. The uniform mass stained dark blue with hæmatoxylin. In one case of simple glaucoma he found a similar mass, while in another the intermediate substance was finely granular. In the optic nerve of this case could be demonstrated a sector of destroyed nerve tissue, which corresponded to a defect in the field that had been found clinically. Numerous caverns were present under a veil-like tissue in the papillæ of both eyes. He thinks that the saturating fluid induced the formation of caverns by maceration. The source of the fluid he thinks is doubtless the vessels, which are always degenerated in glaucoma. Possibly the bundles in the neighborhood of the vessels suffer first, and so explain the isolated destruction of certain nerve fibers, as shown in the visual field. How the destruction of the nerve fibers then proceeds has not yet been studied accurately. At first there is only a saturation with no signs of breaking down, but with granular cells, then the contents of the interstices become homogeneous with products of disintegration demonstrable with soudan. Gradually the interspaces become dilated by the contents so as to create caverns. A deep excavation may be clinically present in a case of glaucoma simplex without a corresponding atrophy of the tissue. The tissue of the papilla may be so transparent that an excavation is simulated. In several cases there were marked changes in the vessels, so it is evident that the origin of cavernous atrophy of the optic nerve comes through vascular disturbances. Aside from the saturating fluid as the preliminary stage of caverns, the possibility must be admitted that hemorrhages in the tissue may be the cause of this disintegration. In many cases it cannot be assumed that the hemorrhages occurred secondarily in preformed spaces.

TODD (64, **An operation for glaucoma filtration secured by a leechbite incision**) has devised an instrument which has three cutting edges coming to a point. When this is inserted at the sclerocorneal junction and enters the anterior chamber a

triangular opening is made. While he does not claim that this operation will supplant trephining he thinks that the opening will remain patent.

ALLING.

BUTLER (62, **The tragedy of sclerostomy**) reports six cases of late infection after sclerostomy. One case was followed by panophthalmitis fifteen months after the operation. It evidently was caused by an acute conjunctivitis which she contracted about two weeks before. In another case the eye was lost five years after the sclerostomy. There was an intercalary staphyloma and the anterior chamber was filled with pus. He considers this to be probably an infection from without, though it may have been an exacerbation of cyclitis as keratitis punctata was always present during the five years. In a third case the patient appeared with a late infection a year and two months after the operation. In five other cases infection appeared in periods from one to nine months after the sclerostomy. In Butler's cases almost every kind of scar was affected and he concludes that the danger of late infection hangs over every kind of filtrating scar.

CURRAN.

XIX.—RETINA, OPTIC NERVE, AND VISUAL TRACT.

65. AXENFELD. **Retinitis externa exudativa with ossification in the seeing eye.** *Archiv f. Ophthalmologie*, xc.

66. GRADLE, H. S. **An abscess of the optic nerve.** *Annals of Ophthalmology*, July, 1915.

67. HIPPEL. **Successful operation for post-traumatic detachment of the retina.** *Klinische Monatsblaetter f. Augenheilkunde*, July-August.

68. MOORE, R. FOSTER. **Lipæmia retinalis.** *Lancet*, February 20, 1915.

69. ROENNE. **Acute retrobulbar neuritis localized in the chiasm.** *Klin. Monatsblaetter f. Augenheilkunde*, July-August.

70. SHUMWAY, E. A. **Acute axial optic neuritis as an early symptom in disseminated sclerosis.** *Ophthalmic Record*, August, 1915.

71. WEST, SAMUEL. **Notes on diabetic retinitis.** *Lancet*, April 11, 1915.

After introductory remarks concerning forms of retinitis which establish themselves in the outer layers of the retina, AXENFELD (65, **Retinitis externa exudativa with ossification in the seeing eye**) reports a case of the nature indicated by the title. He showed a series of pictures of the fundus that

covered the course of the disease from its first appearance, from which it seems that the first signs were punctate hemorrhages about the macula. Yet he believes that the hemorrhages were not primary, as the visual disturbance in places was marked at a time when the ophthalmoscopic examination was wholly negative. The hemorrhages were changeable and took a marginal form accompanying the spread of the disease, an important differential characteristic from sarcoma. The great peculiarity of the case lay in a formation of bone in an eye that possessed vision, except for a central scotoma, a condition that has never before been recognized.

VON HIPPEL (67, **Successful operation for post-traumatic detachment of the retina**) operated on a detachment of the retina that developed sixteen years after a shot wound in such a way that a round cord visible with the ophthalmoscope was divided with scissors introduced through a meridional incision in the sclera. The central vision, which had been lost, was restored to $\frac{5}{20}$ with $-$ 8 D.; the visual field was normal.

ROENNE (69, **Acute retrobulbar neuritis localized in the chiasm**) outlines a clinical picture which presented peculiarities of the visual field before the retrobulbar neuritis, with which it held a common course. The most common defect of the field is a temporal hemianopsia and a central scotoma. These defects show a wandering character which points to a serpiginous course with rapid restoration of the fundamental anatomical condition. The disease often is associated with optic neuritis or choked disk; these ophthalmoscopically visible changes should be looked upon as secondary, caused by the local changes in the optic nerve and chiasm. Seven clinical cases are reported, two of them studied pathologically.

GRADLE (66, **Abscess of the optic nerve**) describes a case of carcinoma of the right antrum with exophthalmos, the eye itself showing no pathological changes. At necropsy the optic nerve was found thickened as far back as the chiasm. The carcinoma, which in places was suppurating, had broken through into the orbit. There was a looseness in the arrangement of the atrophic nerve fibers near the globe leading to the formation of small empty spaces. An abscess consisting mostly of mononuclear leucocytes filled the center of the posterior half of the optic nerve and extended well into the chiasm. The

nerve fibers were pressed to all sides by the abscess. No organisms or carcinomatous cells were found.

ALLING.

MOORE (68, **Lipæmia retinalis**) reports two cases of this condition. The vessels on the disk and for a short distance beyond were salmon-colored. They gradually merged toward the periphery into a cream color with no pink tint. The color of the arteries and veins did not differ. The general tint of the fundus was pale. There were no hemorrhages or exudates, the vision remained unaffected. Both cases were similar and both occurred in diabetics. When it appears in a distinguishable form he considers it implies a grave prognosis, but recovery may occur.

CURRAN.

SHUMWAY (70, **Acute axial optic neuritis as an early symptom in disseminated sclerosis**) relates the case of a young man who presented signs of retrobulbar neuritis in the left eye. The vision was reduced to $\frac{6}{22}$; there was pallor of the temporal side of the optic nerve, and a horizontal oval scotoma for colors. Examination of the nose revealed ethmoiditis and thickening of the anterior wall of the sphenoid cells. There was some improvement after treatment of the nasal trouble, but the color scotoma persisted. For eight years following, the eye conditions remained practically stationary except that the whole nerve became pale. A short time after the eye became affected the patient showed signs of multiple sclerosis and went on to the stage of full development. As the visual tracts are known to be affected in about one half of the cases of multiple sclerosis, and frequently unilaterally, the author is in doubt as to the relation of the sinusitis to the optic atrophy. He suggests that the absorption of toxins from the local purulent focus may be the cause of the atrophy and the general disease as well.

ALLING.

WEST (71, **Notes on diabetic retinitis**) says that diabetes can not be diagnosed from the retinal condition, in the same way that the granular kidney can be diagnosed. He says that many cases of so-called diabetic retinitis are typically albuminuric and are associated with granular kidney. The exudative form is in all cases of toxic origin and might therefore occur in the course of diabetes just as it does in acute nephritis. The

degenerative form of retinitis in which there are white glistening patches grouped round the yellow spot is characteristic of granular kidney whether associated with diabetes or not.

CURRAN.

XX.—ACCIDENTS, INJURIES, FOREIGN BODIES, PARASITES.

72. ABELSDORFF. **Traumatic origin of a gouty scleritis.** *Ærztl. Sachverstg.-Zeitg.*, No. 11.

73. BECKER. **Retinitis proliferans and hemianopsia.** *Muenchener med. Wochenschrift*, p. 1222.

74. BIRCH-HIRSCHFELD. **Injuries of the eye in war, and the care of the eyes of troops.** *Zeitschrift f. Augenheilkunde*, May-June, p. 266.

75. ELWOOD, C. R. **An unusually happy result following the removal of an intraocular foreign body which had been in the eye for nearly four months.** *Ophthalmic Record*, September, 1915.

76. OLOFF. **Remarkable cases of wounds of the eye.** *Deutsche medizinische Wochenschrift*, pp. 1159 and 1190.

77. PARSONS, HERBERT J. **Psychology of traumatic amblyopia following the explosion of shells.** *Lancet*, April 3, 1915.

78. SMALL, C. P. **Birth injuries of the eyes.** *Ophthalmic Record*, August.

79. TURNER, WM. ALDREN. **Remarks on a case of nervous and mental shocks observed in base hospital in France.** *British Medical Journal*, May 15, 1915.

80. WESSELY. **Ophthalmological experiences in the field.** *Wuerzburger Abhandlungen*, XV., No. 9.

WESSELY (80, **Ophthalmological experiences in the field**) says that there is no special grouping of certain diseases of the eye to be marked among the troops. He mentions as of interest some cases of conjunctivitis in cases of old gonorrhea which were caused to break out anew by the exposure to wet in the trenches, cases of metastatic conjunctivitis in acute articular rheumatism, which followed the swellings of the joints in one or two days and were without bacteria at first, three cases of herpes corneæ after antityphoid vaccination, and one in true typhoid. Particularly noteworthy are the cases of hemeralopia which were strikingly frequent during the time of the longest nights. Close examination showed that a part of these were only cases of weakened adaptation, which is particularly annoying when orders come during the darkness. To this class belong a large number of high myopes, part of whom had true hemeralopia from the start, the rest an acutely developed

disturbance which disappeared with the coming of the bright day, the cause of which is unknown. Wounds of the eye are manifold. Ruptures of the eye by shot from a short distance indicate immediate enucleation, not only because of the danger of sympathetic ophthalmia, but also because primary healing is quicker. Loss of both eyes through shot wounds is not very rare, though not as common as the loss of one. Very often the wound of the eye is associated with a laceration of the lids, which should be sutured as quickly as possible to prevent cicatricial adhesions and the resulting deformity. In gaping wounds of the cornea or sclera a conjunctival suture is recommended strongly. Injuries from indirect violence observed were separations of the optic nerves, lacerations of the ciliary vessels, destruction of the retina and choroid; the last healed with a formation of proliferating cicatrices, especially in the fovea centralis, producing the picture of retinitis proliferans. Luxations of the lens, lacerations and tears ot the iris are common. An injury from the air pressure created by a bursting shell was a Berlin's opacity, which disappeared in a few days. Finally the author speaks of wounds of the brain. Hemianopsia, usually bilateral, is common after shot wounds of the occiput. In all kinds of shot wounds of the skull there is apt to be a rapidly appearing choked disk, which disappears quickly after trephining.

PARSONS (77, **Psychology of traumatic amblyopia following the explosion of shells**) explains the symptoms from a psychological standpoint but considers that the early loss of vision in these cases has a definite neural basis, but in the later stages may be of the nature associated with so-called functional conditions. On account of several suspicious symptoms, such as the shooting eye recovering last, disinclination to return to duties, etc., accompanying the results of this emotional shock, he thinks that there is great danger of injustice being done to the men in mistaking these symptoms for evidence of malingering. Regarding therapeutic measures he says it should be remembered that fright causes great exhaustion of suprarenal glands.

CURRAN.

TURNER (79, **Remarks on a case of nervous and mental shocks observed in base hospital in France**), in discussing the

impairment of vision due to shocks, distinguishes two types, one with blepharospasm, photophobia, and symptoms of mild neurasthenia, complaining of being blind, but the sight found to be not impaired. In such cases, usually at the moment of explosion, sand, dust, etc., had blown in the eyes, giving these symptoms. Recovery takes place quickly. In the second type, the patient, after recovering consciousness induced by the shock, suffers from temporary impairment of vision or temporary blindness; the eyeball may be tender to pressure and otherwise look normal.

CURRAN.

BIRCH-HIRSCHFELD (74, **Injuries of the eye in war**) says that no definite estimate can be made of the frequency of wounds of the eye in the present war, though it may be greater than in former ones, as the greater part of sagittal wounds of the head do not come under surgical treatment. Among the wounds of the eye, isolated injuries of the globe are more rare than perforations by small splinters, or contusions by indirect violence which may create very manifold pictures. Serious injuries are caused mostly by shot wounds, and then the question of conservative or operative treatment is of great importance because of the danger of sympathetic ophthalmia. Transverse and oblique shot wounds of the orbit, either with serious injury to the optic nerve, or with indirect effect upon the globe through a severe lesion of the tissues of the orbit, are of great interest. Extensive lacerations of the lids may be caused by the same kind of shots, and their repair often is extremely difficult. Pareses of the ocular muscles and choked disk have been observed in wounds of the brain. Aside from such injuries the author has frequently observed disturbances of the eyes in soldiers returning from the front, consisting of fugacious scotomata, muscular asthenopia, and, above all, hemeralopia with or without changes in the fundus. Trachoma must be treated immediately whenever a case is met with because of the danger of infection. Finally the necessity of accurate correction of anomalies of the refraction is insisted on, especially for troops in the field, and the proposal is made of a flying ophthalmic ambulance under the direction of experienced ophthalmologists.

OLOFF (76, **Remarkable cases of wounds of the eye**) de-

scribes four cases. The first was one of destruction of one eye by a shrapnel ball in a soldier whose other eye had a vision of only $\frac{1}{30}$ on account of strabismic amblyopia. After a month's use of the eye the vision became $\frac{6}{20}$. From this case the writer deduces the need of the earliest possible treatment of strabismus by a specialist. In the second case a left-sided homonymous hemianopsia with hemianopic immobility of the pupil was produced by a shot. The site of the projectile could not be fixed exactly by the condition of the eye, but had to be located by the X-rays. The third case was one of contusion of the eye through the indirect effect of an explosion with hemorrhages into the retina and vitreous. The final result in such cases is retinitis proliferans at the posterior pole. In the fourth case the left eye was destroyed by a bullet that had passed through the man's left shoulder. This patient was first seen by a specialist after he had been treated for several weeks by general surgeons, when there was a large symblepharon and portions of the uvea attached to the sclera of the stump of the eye, which rendered the danger of sympathetic ophthalmia considerable. He urges that special advice should be obtained as early as possible when the eye is wounded.

ABELSDORFF (72, **Traumatic origin of a gouty scleritis**) reports a case of scleritis that followed a blow on the eye in a patient suffering from gouty rheumatism. He thinks the case remarkable in that a scleritis was excited by a contusion, which he can explain only through the gouty diathesis.

EBSTEIN.

BECKER (73, **Retinitis proliferans and hemianopsia**) had a patient with bilateral old retinitis proliferans and a fresh right-sided incomplete homonymous hemianopsia that was caused by a shot wound of the left side of the occiput.

ELWOOD (75, **An unusually happy result following the removal of an intraocular foreign body which had been in the eye for nearly four months**) removed a piece of steel 4 by *2mm*, which had entered the vitreous through the cornea, the iris and the suspensory ligament. It was extracted through a scleral wound. The resulting vision was $\frac{20}{15}$. The only remaining evidence of the accident was a slightly discolored iris and two floating vitreous opacities.

ALLING.

SMALL (78, **Birth injuries of the eye**) describes the condition of an eye in a patient eleven years old. There were scars on the head made by forceps at delivery and the right lower lid had also been cut by the blade. There were three distinct linear opacities extending vertically across the entire cornea in the posterior layers. The iris was tremulous, the lens partly cataractous, and the optic nerve atrophic. The corneal opacity was evidently due to a rupture of Descemet's membrane.

ALLING.